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9

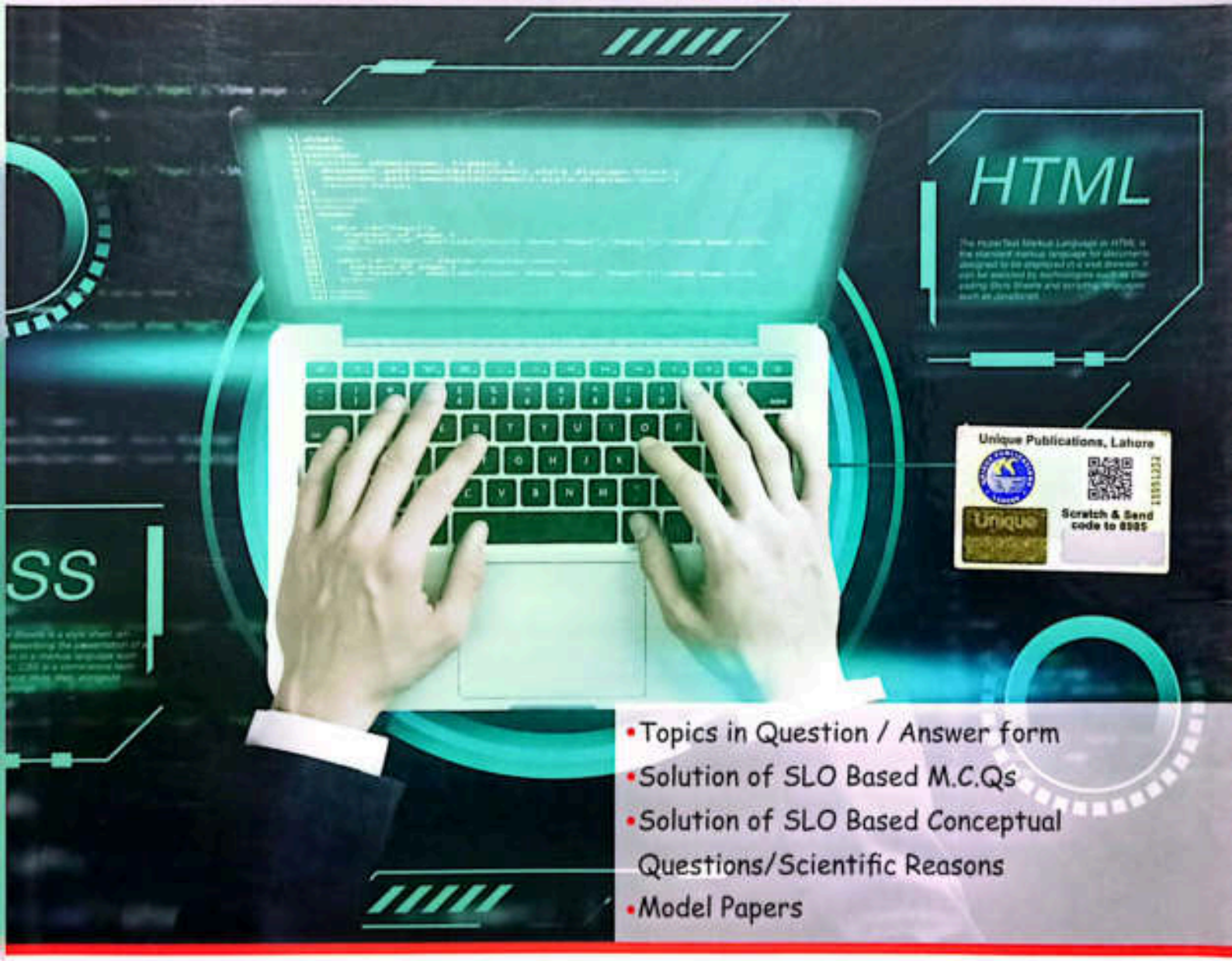
UNIQUE NOTES

1st Choice of Position Holders

According to NEW NATIONAL CURRICULUM for Session 2025-26

COMPUTER SCIENCE

Based upon recommended books of Federal board according to SLO Based Exam System



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Unique Notes
(Federal Board)

Class
9th

According to SLO Based
Exam System of New Curriculum

COMPUTER SCIENCE

Subjective
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Chairman's Message

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Our indefatigable pursuit of educational excellence has inspired us to extend our services into the realm of **Unique Publications**, a visionary initiative aimed at transforming the lives of students across Pakistan. Recognizing the vital need for high-quality, student-centric academic resources, **Unique Notes** have been meticulously crafted by a team of highly skilled, experienced, and devoted educators who possess both subject mastery and a deep understanding of student needs.

At **Unique Group of Institutions**, we believe that every student deserves comprehensive guidance and unwavering support during the formative stages of their academic and professional journey. We walk beside them as mentors and motivators, ensuring they are equipped to excel and secure a future brimming with opportunities, confidence, and success.

Unique Publications is more than just an initiative; it is our pledge to reach every corner of the country, connecting students from bustling cities to the remotest towns with cutting-edge educational material. Through this project, we aspire to democratize education, making world-class learning accessible and inclusive, thus paving the way for a brighter, more empowered Pakistan.

Our vision is clear and resolute: to inspire excellence, foster innovation, and cultivate a generation of well-rounded individuals who will not only achieve personal success but also contribute meaningfully to the nation's progress.

Together, we work toward the ideal of **"Better Education, Better Pakistan"** — a mission that defines us, drives us, and keeps us striving for greater heights.

Abdul Manan Khurram
Chairman UGI

A Word of Thanks

It is a moment of immense pride and satisfaction for me to declare that this book is not merely a helping guide but a testament to the **Unique Group of Institutions' (UGI)** tenacious commitment to empowering students to perform at their very best. This edition stands as a reflection of the tireless efforts and unparalleled dedication of our esteemed teachers, whose professional expertise, subject mastery, and student-centered approach have truly brought this work to life.

The exceptional dexterity demonstrated by our educators in curating this edition reflects both their individual passion and professional commitment to their respective disciplines. Every effort has been made to ensure that the content is **accessible, comprehensive, and aligned with the desired learning objectives**, keeping in view the individual learning needs of students. Equal emphasis has been placed on formative and summative evaluations, ensuring that assessment and learning outcomes are both measurable and achievable.

This book has been meticulously designed with a focus on **clarity, brevity, and precision**, while its carefully curated content serves as a true *"knowledge booster"* for students. Undoubtedly, **Unique Notes** are a proven key to success, empowering students to excel academically and achieve their dreams. I deeply appreciate the **untiring efforts** and profound commitment of our distinguished teachers who have worked diligently to make this edition possible. Their contributions reflect the very essence of **excellence, innovation, and purpose-driven education** that UGI stands for.

Prof. Amjad Ali Khan
Rector UGI

Foreword

Unique Notes have been meticulously prepared in alignment with the recommendations of the **National Education Policy** and modern pedagogical requirements, ensuring that they meet the highest standards of contemporary education. The exercises included within this material are carefully designed to foster not only academic excellence but also the **mental, personal, and intellectual** development of students. Each section has been curated to ignite critical thinking, enhance problem-solving skills, and cultivate a deep understanding of the subjects.

We firmly believe that achieving the dream of **educational advancement** demands continuous effort, innovation, and an unwavering commitment to excellence. With this realization, we are indefatigable striving to create resources that empower learners and inspire educators. In this pursuit, we warmly invite **valuable opinions and constructive suggestions** from scholars, esteemed educators, students, parents, and all stakeholders in society. Your feedback is a cornerstone of our progress and will enable us to continually improve and evolve in our mission to deliver the finest educational resources.

Together, let us join our hands and unite our efforts to envision and create a stronger, smarter, and more enlightened future for our students and our nation—a future that shines as a beacon of progress, knowledge, excellence, and inspiration for generations to come.

Prof. Muhammad Abdullah
Additional Director UGI

CONTENTS

UNIT 01

COMPUTER SYSTEMS

Long Questions

Q.1: Describe brief history of computer system.

Ans: A computer system is a programmable electronic device that performs arithmetic and logical operations. Evolution of computers means how the computers evolved from the first mechanical device, abacus to electromechanical and then the modern electronic digital computers. Now we will discuss some devices.

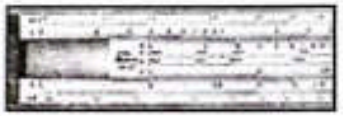
ABACUS

ABACUS was a first counting device made by Chinese near about 5000 years ago. It consisted of a wooden frame having parallel rods. These rods had a number of wooden beads which could slide freely along the length of rods. While performing calculations, beads were moved up and down with fingers. Abacus was used to perform addition, subtraction, multiplication and division.

Napier's Bone

John Napier, a Scottish mathematician created logarithm tables to facilitate calculations. In 1617 he created a device using rods, also called Napier's bones to perform arithmetic calculations. It consisted of a wooden box containing rotating cylinders each of which had the digits from 0 to 9. It could multiply, divide and find square roots of numbers by using simple addition and subtraction.

Slide Rule



Based on the idea of logarithm, English mathematician, William Oughtred developed a device called Slide Rule in 1920s. It was very useful for solving problems that involved multiplications and divisions. It has three parts, slide, rule and a transparent sliding cursor.

Pascaline

Blaise Pascal, a French mathematician invented a calculating machine called Pascaline in 1642. Pascal invented a machine that had a system of gears. Pascaline used rotating wheels. Each wheel had ten parts having digits from 0 to 9.Calculations were performed by the rotation of wheels.

Difference Engine

In 1820s ,Charles Babbage invented a machine called "Difference Engine". Difference Engine was intended to be steam powered and fully automated, including printing of the results.

Analytical Engine

Babbage worked for many years on difference Engine but he could not complete it. Later in 1830 he came up with idea of Analytical Engine. It was a general-purpose programmable computing engine. The Analytical Engine has many essential features found in the modern digital computer.

Hollerith Desk

In 1890, Herman Hollerith builds a tabulating machine called Hollerith Desk. This machine was invented to help with the census of 1890 in America.

Mark-I

It was invented by Howard Aiken in 1944. Mark-I could add three numbers having eight digits in one second. It could print out its results on punched cards or on an electric typewriter. Mark-I was 50 feet long, 8 feet high and weighed about 5 tons. It used 3,000 electric switches.

Since computer evolution is a continuous process, it had not stopped in the modern era. New systems are being developed to provide voice recognition and understand natural languages.

High performance computing (HPC)

High performance computing (HPC) is being used in today's data centers for fast data processing. High-performance computing (HPC) is the use of parallel processing for running advanced applications programs efficiently, reliably and fast.

Cloud Computing

The concept of "**Cloud Computing**" has been introduced. In the simplest, terms, cloud computing means storing and accessing data and programs over the Internet instead of computer into intelligent machine having thinking power. The evolution of computers will probably continue till their processing capabilities have become equal to human intelligence or even beyond that.

Q.2: Briefly describe the Generations of computers.

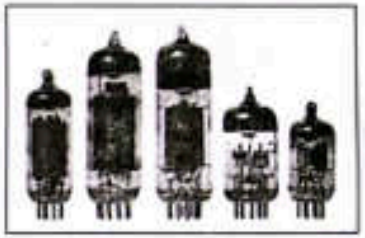
Ans: Generations of Computer:

The modern age computer took its presentation with the invention of your time. It had been around the 16th century when the evolution of the computer started. The initial computer faced many changes, obviously for the betterment. It continuously improved itself in terms of speed, accuracy, size, and price to urge the form of the fashionable day computer. There are five computer generations known till date.

- First Generation: **Vacuum Tubes.**
- Second Generation: **Transistors.**
- Third Generation: **Integrated Circuits.**
- Fourth Generation: **Microprocessors.**
- Fifth Generation: **Artificial Intelligence.**

First Generation: Vacuum Tubes (1940-1956)

Computers created between 1940 and 1956 are considered the first generation. They were big and only could do simple computations. They were made up of bulky components like vacuum tubes. These computers used a machine language called 1GL, or first generation language, as its input mechanism.



UNIVAC1, ENIAC, IBM 701 and **IBM 650** are a few examples.

Second Generation: Transistors (1956-1963)

1956–1963 saw the development of second generation computers. These computers were more dependable since transistors were employed in place of vacuum tubes. They were far more portable as a result than the first computers. Higher level programming languages such as COBOL, FORTRAN, etc. were the input for these machines. A few instances of computers from the second generation are the **IBM 1620, IBM 7094, CDC 1604, CDC3600, and UNIVAC 1108.** They were consequently quicker than their predecessors because they operated on AC.

Third Generation: Integrated Circuits (1963-1971)

Computers created in the third generation, which ran from **1963 to 1971**. The inclusion of novel circuit elements like **integrated circuits (ICs)** set these computers apart from the first and second generations of computers. Transistors, resistors, and other circuit components that make up a computer can be found in thousands upon thousands of integrated circuits, which are tiny devices. The Integrated Circuit, sometimes known as IC chips, is credited to **Jack Kilby.** The ability to incorporate thousands of circuit parts into a tiny space was made feasible by the development of **integrated circuits (ICs),** which led to an eventual reduction in the size of computers. IBM-360 series, Moneywell-6000 series, PDP (Personal Data Processor), IBM-370/168 are examples of third generation computer.

Fourth Generation: Microprocessors (1971-Present)

From 1971 to present, computers belonged to the Fourth Generation. The **Very Large Scale Integrated (VLSI)** circuit technology was used in these computers. As a result, another name for them was microprocessors. The first company to create a microprocessor was Intel. This generation produced the original **IBM** "personal computer," or PC. **VLSI** circuits could execute a wide

range of complex operations and computations because of their over **5000** transistors on a tiny chip. **STAR 1000, CRAY-X-MP (Super Computer), DEC 10, PDP 11, and CRAY-1** are a few example

Fifth Generation: Artificial Intelligence (Present and Beyond)

The most sophisticated computer generation to date is the one we are using today. This generation of computers started around 1981 and is currently in use. The contemporary high-level languages, such as Python, C#, Java, etc., are among the input methods. These use ULSI, or Ultra Large Scale Integration, technology and are incredibly dependable. These computers are being utilized to construct Artificial Intelligence, or AI components that will be able to reason for themselves. They are at the cutting edge of current scientific computations. **Intel P4, Intel Core i3–i10, AMD Athlon**, and so on are several examples.

Q.3: Discuss natural and artificial systems.

Ans: Natural Systems

A natural system is an interconnected collection of elements or components that exist in the nature. These systems are typically found in the environment and are characterized by their ability to self-regulate, adapt, and maintain a certain degree of stability. Natural systems are incredibly diverse and fascinating, each with its unique characteristics and interactions. Some natural systems are shown in **Fig.**

The following are a few examples of natural systems.

Ecosystems: Ecosystems are perhaps the most common and diverse natural systems. They encompass various types, including:

- **Forest Ecosystems:** Such as a tropical rainforest with its myriad of plant and animal species.
- **Aquatic Ecosystems:** Like freshwater lakes, rivers, and marine ecosystems such as **coral reefs.**
- **Grassland Ecosystems:** Such as the African savanna, home to grazing animals like zebras and wildebeasts.

Weather Systems: Weather systems involve the interactions of the Earth's atmosphere, including phenomena like rainfall, wind patterns, and temperature changes.

Geological Systems: These systems encompass geological processes and features like:

- **Plate Tectonics:** The movement of Earth's lithospheric plates, leading to phenomena like earthquakes and volcanic eruptions.
- **Mountain Systems**: Such as the Himalayas, formed by tectonic plate collision.

Hydrological Systems: These systems involve the movement, distribution, and quality of water on Earth, including rivers, lakes, and the water cycle.

Solar System: Our solar system itself is a natural system, with the Sun, planets, moons, asteroids, and comets all interacting under the influence of gravity.

Biological Systems: Biological systems encompass a wide range of living organisms and their interactions:

- **Human Body:** A complex biological system with organs, tissues, cells, and biochemical processes.
- **Coral Reef:** An ecosystem built by coral colonies and inhabited by various marine species.
- **Rainforest Canopy:** The upper layer of a rainforest, home to a unique set of plants and animals.

Artificial Systems

Artificial systems, also known as man-made or human-made systems, are created and designed by humans to serve specific purposes, solve problems, or achieve particular goals. Unlike natural systems, which occur organically in the natural world, artificial systems are intentionally constructed by humans to address various needs and objectives. These systems can range from simple devices to highly complex structures, and they exist in numerous domains.

Artificial systems are essential components of modern society, contributing to our ability to meet a wide range of needs and advance in various fields. They often require careful planning, engineering, and maintenance to function efficiently and effectively. Some artificial systems are shown in above Fig.

The following are some common examples of artificial systems.

Communication Systems:

- **Telephone Networks**: Created to facilitate voice communication over long distances.
- **Internet and Computer Networks**: Built to enable data sharing and digital communication globally.
- **Satellite Communication Systems:** Developed for long-distance, wireless communication.

Information Systems:

- **Databases:** Used for storing and retrieving data efficiently.
- **Software Applications:** Such as word processors, spreadsheets, and video editing software.

Transportation Systems

- **Automobiles**: Designed for personal and mass transportation on roads.
- **Aircraft:** Engineered for air travel, including commercial airplanes, helicopters, and drones.
- **Trains and Rail Systems**: Developed for efficient land transportation on tracks.
- **Subways and Mass Transit:** Designed to move large numbers of people within urban areas.

Energy Systems

- **Power Plants**

Designed to generate electricity using various energy sources like coal, natural gas, nuclear, or renewable resources.

- **Renewable Energy Systems:** Including solar panels, wind turbines, and hydroelectric plants.
- **Electrical Grids**: Infrastructure for the distribution of electrical power.

Manufacturing Systems:

- **Factory Automation:** Systems that automate manufacturing processes, such as robotics and conveyor systems.
- **Assembly Lines**: Organized systems for mass-producing goods.

Healthcare Systems

- **Hospital Information Systems (HIS)**: Designed to manage patient records, billing, and other healthcare data.
- **Medical Devices**: Including MRI machines, X-ray equipment, and artificial organs.

Q.4. What are input devices? Explain different input devices.

Ans: Input Devices:

The devices, which are used to enter data and instructions into the computer, are called input devices. Some input devices are following.

Keyboard

Keyboard is a standard input device used to enter textual data into the computer. It allows the computer users to enter letters, numbers and special symbols into the computer.

Mouse

A mouse is an input device that rolls on a flat surface and controls the pointer on the display screen. As you move the mouse, the pointer on the display screen moves in the same direction.

Microphone

A microphone is an input device used to digitally record audio data, such as human voice. It changes audio signals into electrical signals which are translated into digital form by the sound card for processing in the computer.

Scanner

It is a device that captures images from photographs, magazines, books etc. and stores them in computer in digital form. These images can be edited, displayed on the screen or inserted in documents.

Barcode Reader

It is a device that reads the barcode printed on products that represents products code, description and price. This information is used by the computer to print bill for the customers.

Digital Camera

It is a device used to capture pictures and store them in digital form. These pictures can be downloaded to computer for editing, viewing or inserting in documents.

Touch Screen

It is a pressure-sensitive display screen that is used to interact with the computer by touching pictures or words with finger. Touch screen is more commonly used with mobile phone and tablet.

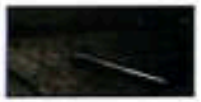
Joystick

A joystick is an input device used to control gaming and, on occasion, graphical applications. It was first invented in 1926 by C. B. Mirick in the United States.

Light Pen

A light pen is used to select a menu item or draw graphics on the monitor's screen.

A tiny tube contains both a photocell and an optical system. The tip of a light pen being moved across a monitor screen. Additionally, the light pen is an optical input device.



Webcam

A webcam is a video camera that connects to a computer or other device, usually via a USB port, and captures and transmits video over the internet. Webcams are widely used in video conferencing, live streaming.

Q.5: Write a note on System Unit.

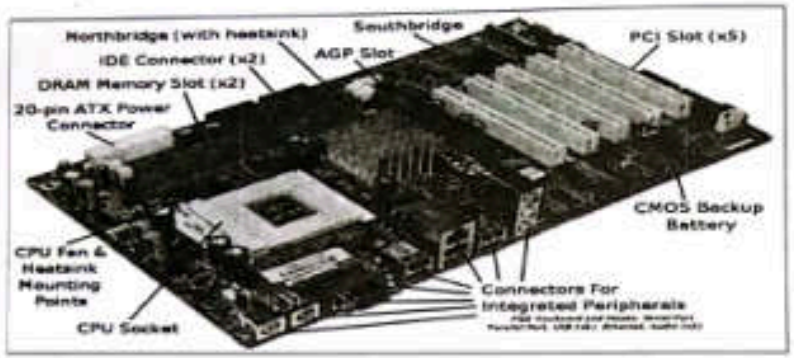
Ans: System unit is the main part of computer system unit contains a number of other components, which are enclosed in a rectangular casing. This casing is of two kinds:

1. Tower casing.
2. Desktop casing.

System unit includes motherboard, power supply and drives (such as DVD and hard disk) inside the computer casing. All the input/output devices of a computer are connected to system unit through the ports.

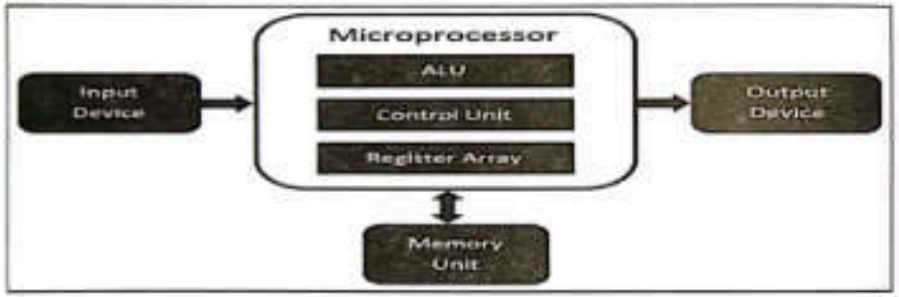
Motherboard

Motherboard is the main circuit board inside the system unit. It is made up of silicon. It is the most important component of system unit. It is a rigid rectangular circuit board. All other components are attached onto it. It contains microprocessor, main memory, expansion cards, many ICs chips, connectors and other electronic components. It has many buses (electric pathways) printed on it. These are used to transmit information between various components of the computer. All the input/output devices are connected to the motherboard.



Microprocessor

A microprocessor is the main chip on the motherboard that controls all the activities of the computer. It is also known as Central Processing Unit (CPU) or simply processor. It contains Control Unit (CU), Arithmetic Logic Unit (ALU) and registers.



ALU (Arithmetic and Logic Unit)

The arithmetic and logic unit consists of electronic circuitry that executes all arithmetic and logic operations. ALU can perform the following operations

1. **Arithmetic Operations**

- Addition
- Subtraction
- Multiplication
- Division

Did You Know?

ARM CPU's are used in smartphones and tablets. These CPU's are smaller in size along with less processing power, and generate less heat.

2. **Logical Operations:**

A logical operation is usually a comparison of numbers, letters, or special characters.

CU (Control Unit)

The control unit consists of circuitry that generates signals to direct the entire computer system to carry out the execution of the program. The CU doesn't execute the program instructions rather it directs other parts of the system to do so. The CU must communicate with ALU, memory and other parts of computer system.

Registers

Registers are small memory units inside the microprocessor used to temporarily store some information during the execution of a program. Some commonly used registers are Instruction Register, Accumulator Register, Data Register and Memory Address Register.

Q.6: What is computer storage? Explain different computer storage. OR Explain secondary memory.

Ans: Storage devices are used to store programs and data that are not currently used by the computer. They have huge storage capacity. Therefore, they are also known as mass storage devices or secondary memory. Hard disk is the most commonly used storage device that is fixed inside the system unit. Portable storage devices are CD, DVD, memory cards and USB flash drive. Portable storage devices have less storage capacity than hard disk but they are cheap and easy to carry.

Hard Disk

Hard disk is an example of secondary storage device, which is used to store digital data permanently. A hard disk is a magnetic storage device used to store computer data. It has storage capacity of hundreds of Gigabyte (GB). It is fixed inside the computer casing. Portable hard disk is also available that is attached to USB port.

CD (Compact Disk)

CD is the one of the most prominent optical storage device. CD is usually called CD – ROM (Compact Disk Read Only Memory). It is a portable optical storage device with a storage capacity of 700 Megabytes (MB). A CD is 1.2 millimeter thick with a diameter of 120 millimeters. CD drive is used to read data from or write data to a CD.

DVD (Digital Versatile Disk)

DVD has the same thickness and diameter as CD but has more storage capacity. Its storage capacity is in the range of 4 to 16 GB. A DVD writer is installed in the computer to read data from or write data to a DVD. A CD can also be used in a DVD writer.

Memory Card

Memory card is a small storage device having storage capacity of few Gigabytes. It is available in different sizes and storage capacities. Memory cards are generally used in laptop computers and portable devices such as mobile phone and digital camera for storing pictures, audio and video.

USB Flash Drive

USB flash drive is a small portable drive that is connected to computer through USB port. It is also known as USB memory. It is very fast in operation and its storage capacity is up to 128GB till now.

Q.7: What are output devices? Explain its types.

Ans: The devices which are used to receive data and information from the computer are called output devices. Some output devices are following.

Monitor

Monitor is most commonly used output device. It is also called a display or screen.

Types of monitor

It has two common types i.e. CRT (Cathode Ray Tube) monitor and LCD (Liquid Crystal Display) monitor.

CRT monitor

CRT monitor is very similar to old television. It is not commonly used due to its big size and low display quality.

LCD monitor

LCD monitor is slim, uses less power and has better display quality than CRT monitor.

Printer:

A printer is an output device that produces hardcopy on the paper. Depending upon their printing mechanism, they fall into two following categories i.e.

1. Impact Printers 2. Non-Impact Printers

1. Impact Printers: An impact printer produces print by striking an inked ribbon with a hammer or a set of pins, pressing ink from the ribbon on a piece of paper. Impact printers are the oldest technologies but still used due to their low cost. Three most common forms of impact printers are: Dot Matrix Printer, Daisy Wheel Printer and Line Printer etc.

2. Non-Impact Printer: A non-impact printer produces images on a paper without striking the page, and they are quite fast.

Inkjet printer: Inkjet printer stores ink in cartridge and sprays on paper through fine nozzles on the print-heads. Inkjet printers are used in all sectors such as homes and simple businesses.

Laser printer: Laser printer uses technology similar to photocopying machine.

Laser printer is more expensive, faster and has very high print quality compared to inkjet printer. Laser printers are perfect for large scale businesses.

Plotter: A plotter is a large-scale printing device that receives commands from a computer to make drawing on the paper with one or more automatic pens.

Uses of plotter: Plotter is an output device used for printing engineering drawings, machine parts, building designs, maps, charts and pan flexes etc. on large size paper/sheets. Such large size printing is not possible on printers. It is more expensive than printer. There are two types of plotters.

Ink plotter: Ink plotter is used for printing images.

Pen plotter: pen plotter is used for printing engineering drawings, machine parts, building designs, etc.

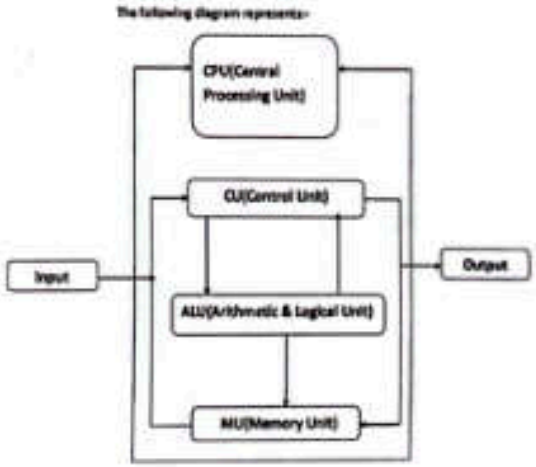
Speaker: Speaker is a device used to produce audio output. A pair of speakers is attached to the sound card on the motherboard. Speakers are commonly used with multimedia software and for playing music and videos on computer.

Multimedia Projector: A projector is an output device that may reproduce images created by a computer or Blu-ray player on a screen, wall, or other surface. Typically, the projected surface is large, flat, and light-colored.

Q.8: Discuss Von Neumann Architecture?

Ans: A computer can process data, images, audio, and graphics. The diagram that depicts the major components of the computer system is referred to as the computer block diagram. The block diagram depicts the basic description of a computer system: it accepts some data, processes it, and then provides the final product. A computer block diagram depicts a computer system's structure. The block diagram provides a fast overview of a computer's working process, from data entry to retrieval of desired output. It was published by John Von Neumann in 1945.

Input: All data received by the computer passes through the input unit. The input unit includes several devices such as a mouse, keyboard, and scanner. In other words, each of these devices serves as a link between users and computers.



CPU: The Central Processing Unit (CPU) is known as "the brain of the computer" since it regulates the operation of all computer components. It works in the same way as the human brain does. The CPU regulates all tasks, just as the brain does for all human actions. The Central Processing Unit is the heart of any computer system. A computer's CPU both regulates its functioning and performs data processing operations. CPU is often abbreviated as processor. A program is a set of instructions that tells the computer how to perform a certain operation, such as sending a file to the printer, opening a browser window, or playing audio or video.

ALU (Arithmetic and Logic Unit)

The arithmetic and logic unit consists of electronic circuitry that executes all arithmetic and logic operations. ALU can perform the following operations:

1. **Arithmetic Operations:**
   - Addition
   - Multiplication
   - Subtraction
   - Division
2. **Logical Operations:**

A logical operation is usually a comparison of numbers, letters, or special characters.

Control Unit

The control unit consists of circuitry that generates signals to direct the entire computer system to carry out the execution of the program. The CU doesn't execute the program instructions rather it

directs other parts of the system to do so. The CU must communicate with ALU, memory and other parts of computer system.

Memory Unit

The memory unit stores all of the data that has to be or has already been processed. The memory unit serves as a hub for all data. It sends it to the appropriate section of the computer when necessary.

Output:

All information delivered to the computer after processing is received by the user via the output unit. The output unit includes devices such as printers, monitors, and projectors.

Q.9: How many types of memories on motherboard? Explain it with computer memory units.

Ans: There are three types of memories on the motherboard which are ROM (Read Only Memory), RAM (Random Access Memory) and Cache. These are known as main memory or primary memory of computer.

ROM (Read Only Memory)

ROM stands for Read Only Memory. It is a non-volatile memory. Data stored in ROM are not lost when we shutdown the computer. Data stored in ROM can be read only but new data cannot be written into it. It stores the Basic Input output System (BIOS) of computer that controls input/output devices and the start-up or boot process.

BIOS programs

BIOS programs test the computer's components when it is turned on and then load the operating system into the RAM to make the computer ready for operation. BIOS programs are permanently stored in ROM when it is manufactured.

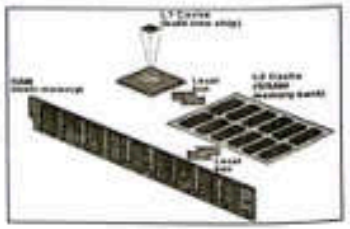
Types of ROM

There are three common types of ROM

- PROM (Programmable ROM)
- EPROM (Erasable Programmable ROM)
- EEPROM (Electronically Erasable Programmable ROM).

RAM (Random Access Memory)

RAM is the primary storage device and the data and instructions are stored temporarily in it. It is also called volatile memory. It is addressable memory. The contents of the RAM are lost when we shutdown the computer. RAM is high speed memory installed on the motherboard. It is READ/WRITE memory.



Cache Memory

Cache is a very small amount of extremely fast memory inside the microprocessor or on the motherboard. It is faster and more expensive than RAM.

Types of cache memories

There are three types of cache memories which are Level 1 (L1), Level 2 (L2) and Level 3 (L3) as L1 cache is built inside

the microprocessor whereas L2 and L3 are on the motherboard. L1 cache is faster than L2 and L3 cache.

Memory Units

The memory unit represents the quantity of data that can be stored in the storage unit. This storage capacity is stated in bytes. Below explains the main memory storage units.

Bit (Binary Digit)

A binary digit is logical 0 and 1 representing a passive or an active state of a component in an electric circuit.

Nibble

A group of 4 bits is called nibble.

Byte

A group of 8 bits is called byte. A byte is the smallest unit, which can represent a data item or a character.

Word

A computer word, like a byte, is a group of fixed number of bits processed as a unit, which varies from computer to computer but is fixed for each computer.

Q.10: What is system software? Explain its different types.

Ans:

System Software

The software used to control, monitor, or facilitate the use of the computer is called system software.

Types of system software

Following are the types of system software.

- Operating system
- Device drivers
- Utility programs
- Language processors

Operating System

An operating system is a set of programs running on a computer system and providing an environment in which other programs can be executed and the computer system can be used efficiently. **Examples:** MS windows, DOS, UNIX etc.

Functions of an operating system

The following tasks are performed by the operating system.

- Manages hardware resources.
- It controls the operation of input/output and storage devices.
- It detects hardware failures and displays messages to fix them.
- Loads and executes programs.
- Memory management.
- Provides interface to the users.
- It manages files and folders.
- It allows creating password to protect computers from unauthorized use.

Device Drivers

A device driver is system software that controls the operation of a computer device. When users attach a device such as printer or scanner to their computer, they should install its driver also to make it operational. Device drivers are provided by device manufacturers.

Utility Programs

Utility programs perform specific tasks that are related to the management of the computer. The following are some commonly used utility programs that perform specific tasks.

- **Windows Explorer:** It is used to manage files and folders.
- **Backup Utility:** It is used to make backup of data.
- **WinZip utility:** It is used to compress files.
- **Diagnostic utility:** It is used to detect hardware and software problems.
- **Antivirus software:** It is used to detect and remove viruses.

Language Processors

Language translator or processor is the program that translates a high or low-level language program into machine code. Machine language is directly understood by the computer. Therefore, all the programs must be translated into machine language before execution by the computer.

Compiler and interpreter are language processors used to translate high level language programs into machine language.

Q.11: What is application software? Explain its types.

Ans: Application Software

The Application software is a program created to perform a specific task for user. Application software is developed for computer users to solve their problems such as preparing a letter, creating a presentation or managing a database.

Types of application software

Commonly used application software are following.

- Productivity software.
- Business software.
- Entertainment software.
- Education software.

Productivity Software

Productivity software includes word-processing, spreadsheet and database management software packages. These software packages are used by individuals to speed up their daily routine tasks by doing their work in an organized and efficient way.

Business Software

Any software that helps in running business in a more efficient way to improve productivity is known as business software. Some examples of commonly used business software are accounting, sales and marketing, inventory control, project management and payroll software.

Entertainment Software

Software developed to entertain people is known as entertainment software. Video games are one of the most popular forms of entertainment software. Many games are lot of fun to play but sometimes they can also help to improve skills such as typing or reading. The term edutainment merges games and education software into single software. Edutainment software is used mainly for entertainment but it educated as well.

Education Software

Software developed for educational purpose is known as education software. A large variety of education software has been developed. Education software includes typing tutor, spelling tutor, language learning, medical and healthcare, driving test and flight simulation software, etc.

Q.12: What is programing language? Discuss its types.

Ans: Programming Languages

A programming language is a structured and systematic method of communicating instructions to a computer. It consists of a set of predefined commands, syntax, and rules that allow programmers to write instructions, enabling the computer to perform specific tasks or solve problems. It serves as a

means of communication between a human programmer and a computer, facilitating the development of software and applications.

Programming languages can be classified into two categories, that is, low level languages and high level languages.

Low Level Languages

Low level language is machine-oriented language and easily understandable by machines. To understand low level language, detailed knowledge of internal working of computer is required. Low level languages include machine language and assembly language.

Machine Language: Programming language that is directly understood by computer hardware is known as machine language. Machine language is associated with architecture of computer. Therefore, programs written in machine language for one computer will not work on another because of design differences. It consists of 0's and 1's. It is almost impossible for humans to use machine language because it entirely consists of numbers.

Assembly Language: Assembly language consists of symbolic codes or abbreviations known as mnemonics. It was developed to make computer programming easier than machine language. The abbreviations used in assembly language make it easier to learn and write programs compared to machine language. A program written in assembly language must be converted into machine language before it is executed by computer. A program known as assembler is used to translate assembly language into machine language.

High Level Languages (HLLs)

High level languages are English-oriented languages and they are commonly used for writing computer programs. These languages use English language words such as print, goto, if, end, etc. Therefore, they are easy to learn and use. Some examples of high level languages are Visual Basic, C, Java and Pascal.

A program known as compiler/interpreter is required to translate a high level program into machine language. Coding and debugging of a high level language program is much easier than a program written in a low level language. High-level languages can be classified into procedural, structured and object-oriented programming languages.

Procedural and Structured Languages

Procedural programming is based upon the concept of modular programming. In modular programming, programs are divided into smaller parts known as modules. Modular programs consist of one or more modules. A module is a group of statements that can be executed more than once in a program. Each module in a program performs a specific task.

Sequence: It means, writing program statements in a logical sequence. Each step in the sequence must logically progress to the next without producing any undesirable effects.

Selection: It allows the selection of any number of statements based on the result of evaluation of a condition which may be true or false. Examples of statements that implement selection in programming are if, else-if, switch, etc.

Repetition (loops): It means executing one or more statements a number of times until a condition is satisfied. Repetition is implemented in programs using statements, such as for and while loops. Some examples of structured and procedural languages are FORTRAN, Pascal, C, BASIC, ALGOL, PL/1 and Ada Pascal.

Object-Oriented Programming Languages

Object-oriented programming (OOP) refers to a programming method that is based on objects such as student, vehicle, building, etc. Object-oriented programming language provides a set of rules for defining and managing objects. An object can be considered a thing that can perform a set of activities. For example, the object vehicle can be defined as an object that has number of wheels,

number of doors, color, number of seats, etc. The set of activities that can be performed on this object include Steer, Accelerate, Brake, etc.

Q.13: Explain the uses of low level language and high level language?

Uses of Low Level Languages

Important uses of low-level programming languages include:

Use	Explanation
Operating System Development	Writing the core software that manages hardware resources
Device Drivers	Creating software to enable communication with hardware devices.
Embedded Systems	Programming microcontrollers and Iot devices for specialized functions.
Firmware Development	Developing software that resides on hardware components.
Real-Time Systems	Ensuring precise timing and responsiveness in industrial control, robotics, and aerospace systems.
Security Tools	Building intrusion detection, firewalls, and encryption software for robust security.
Game Development	Optimizing game engines, physics simulations, and graphics rendering for performance

Uses of High Level Languages

Important uses of high-level programming languages include:

Use	Explanation
Applications (Apps) Development	Creating desktop, mobile, web applications (Apps) for various platforms.
Web Development	High-level languages are used to build websites, making them interactive and functional.
Data Analysis and Science	Analyzing large datasets and conducting scientific research.
Machine Learning and AI	Developing machine learning models and AI algorithms.
Automation and Scripting	Automating tasks and process, including system administration and data manipulation.
Game Development	Developing game-play logic, AI, and user interfaces for games.
Database Management	Creating, querying, and managing databases.
Scientific and Engineering Simulations	Simulating complex system and conducting simulations.
Business Software	Developing enterprise-level software for various industries.
Educational Tools	Creating e-learning platforms and educational software.

Q.14: Discuss network communication components?

Ans: Network Communication Components

Data communication is the process of transferring information from one point to another in a networking environment. Network communication consists of five basic components, as shown is Fig.

- Sender
- Message
- Medium
- Protocol
- Receiver

Sender

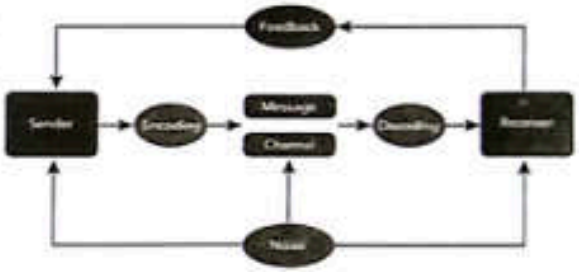
Sender, also called transmitter is a computer/device that sends the message (data or information) from source to destination in a communication network. It may be a computer, workstation, cell phone or camera. The sender device converts the electrical signal into a form that is suitable for transmission over the communication network.

Message

Message is the data or information that is to be transmitted. Message can be in the form of text, audio, video, or any combination of these.

Medium

Medium is the path through which message travels from source to destination. Medium can be wired, for example telephone cable, coaxial cable and fiber optics. It can also be wireless for example Bluetooth, Wi-Fi, microwave, radio wave and satellite.



Receiver

Receiver is the device which receives transmitted message. It can be a computer, workstation, telephone handset or television set. The data received from the transmission medium may not be in proper form to be accepted to the receiver and it must be converted to appropriate form before it is received.

Protocol

A protocol is a set of rules that governs data communications. It represents an agreement between the communicating devices. Without a protocol, two devices are connected but may not communicating with each other.

Q.15 What are the modes of network communication?

Modes of Network Communication:

Modes of network communication refer to the methods or transmitted from one place to another or the ways information is:

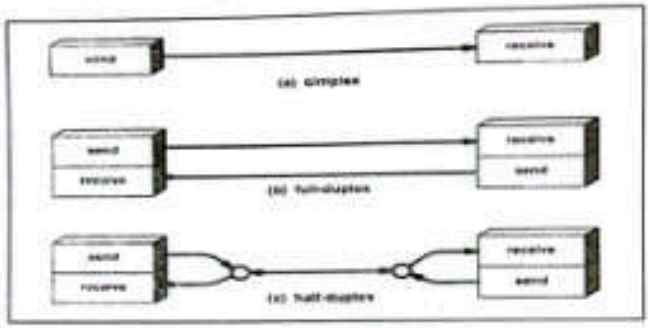
The following are different modes of data communication

- Simplex, Half-duplex and Full-duplex
- Synchronous and Asynchronous

Simplex mode

In Simplex mode, the communication takes place in only one direction. In this mode communication is unidirectional, i.e. the communication can only take place in one direction and it is not possible for the receiver to send data back.

Data being sent to an electronic notice board found in train stations and Airports as shown in Fig. Radio and television broadcastings are also examples of simplex transmission.



Half-duplex mode

In half-duplex mode, the communication takes place in both the directions but not at the same time. The signal can only be sent or received at one time. A common example of this type of communication is the use of walkie-talkies, where each of the persons communicating must indicate when they have finished speaking. Half-duplex transmission is used also in transaction-oriented systems, for example communication between a computer and credit card machine.

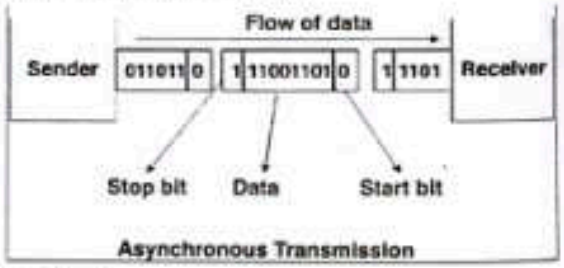
Full-duplex mode

In full-duplex mode, the communication takes place in both the directions at the same time. In this mode, both sender and receiver can send and receive the data simultaneously. For example when two computers communicate with each other to send and receive some data. It is the fastest bi-directional mode of communication. The full-duplex mode is like a two way street, with traffic flowing in both directions at the same time.

One common example of full-duplex communication is the telephone network. When two people are communicating by a telephone line, both can talk and listen at the same time.

Asynchronous Transmission

In asynchronous transmission, the time interval between two character 40/85 and not fixed. The computer devices can exchange information own rate, slow or fast. Start and Stop bits are used in asynchronous transmission. These bits provide timing (synchronization) for the connection between the sender and the receiver.



Synchronous Transmission

In synchronous transmission, the time interval between two characters is always the same. In this method two communicating devices are synchronized and they continue to send characters in order to remain synchronized, even if there is no data to be transmitted.

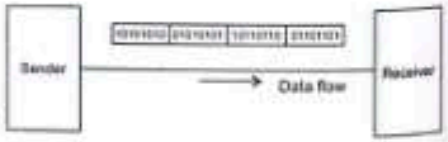


Figure Synchronous transmission

Q.16 Discuss the types of networks.

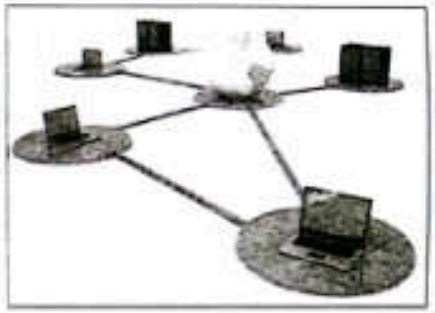
Ans: The following are different types of networks based on the size and physical area they cover.

LAN: A Local Area Network (LAN) spans a limited physical area. It is confined to a single

building or a group of nearby buildings. LANs are used for sharing applications, printers, group scheduling, e-mail, project tracking and other tasks.

Characteristics of LAN

- Spans a small physical area.
- Uses high-speed wired/wireless connections between computers.
- It is a very reliable network. Communication errors are very rare.
- It consists of a limited number of computers.



Wide Area Networks

A Wide Area Network (WAN) spans a large physical area, connecting several sites of an organization across cities, countries and continents. Because of the longer distances involved, WANs are sometimes referred to as long-haul networks.

A WAN is often made up of two or more LANS connected together. For example, you might have a LAN at each site of your organization and each of those LANs might be connected together to form a WAN.

Characteristics of WAN

- Spans a large physical area. It can be worldwide like Internet.
- Communication speed is slow as compared to LAN.
- Connects computers through public networks, leased lines or satellites.
- Connects multiple LANs.
- Sometimes communication errors occur due to its complexity.

Metropolitan Area Network

- (MAN) can span from several buildings or a large campus to entire cities. MAN is used by many organizations. It also connects a number of local area networks with high-speed communication lines.

Characteristics of MAN

- It is larger than a LAN and smaller than a WAN. Covers an area of between 5 to 50 km. diameter.
- Uses fiber optic cable or microwave transmission.
- Provides high-speed communication.
- Used by telephone companies, Internet Service Providers and cable TV companies.

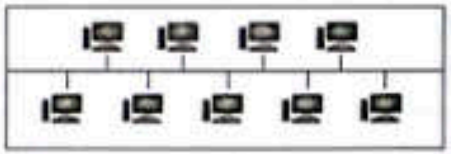
Q.17: What is topology? Discuss its type in details.

Ans: Network Topologies

The arrangement of network nodes (any devices which are part of network) and connections between them is called the network's topology. A node represents any device on the network. Topology is simply a map of the layout of nodes and connections in the network. Four network topologies are popular today, namely, Bus, Star, Ring, and Mesh.

Bus Topology

Bus network topology connects each node to the network along a single piece of cable, Called a backbone of bus topology. Bus network topology is shown in figure.



Features of Bus Topology

- Suitable for a small network.
- Easy to connect a computer or a peripheral device to the network.

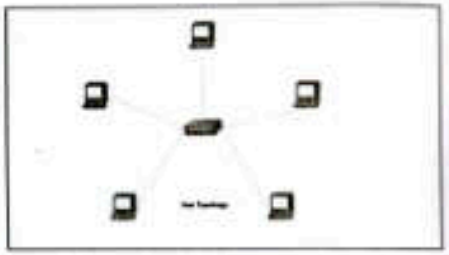
- Requires less cable to implement.
- Terminator is installed at each end of the cable to prevent signals from reflecting back onto the bus and cause errors. Terminator is a device that is attached to ground.

Limitations of Bus Topology

If the single cable is damaged or broken at any point, the entire network can go down. Difficult to identify the problem if the entire network goes down. Not suitable for large network.

Star Topology

In a star network topology, each network node is connected to a central device called a hub. Large networks can require many hubs and hubs can be connected to each other to create a single large network. Star network topology is shown in Figure.



Features of Star Topology

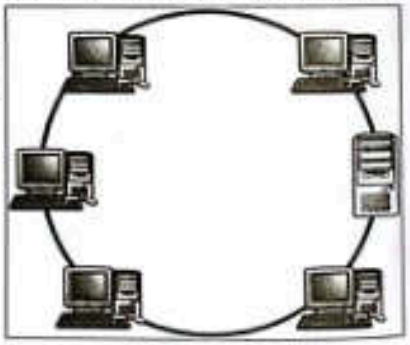
- It is suitable for both small and large networks.
- Easy to install and wire.
- Easy to detect and remove faults.
- Failure of cable does not stop functioning of the entire network.

Limitations of Star Topology

- Failure of the hub causes the entire network to go down.
- Expensive topology to implement. Lengthy cable with a hub is required to install star topology

Ring Topology

Ring topology is shaped just like a ring. It is made up of an unbroken circle of network nodes. Ring network topology is shown in Fig.



Features of Ring Topology

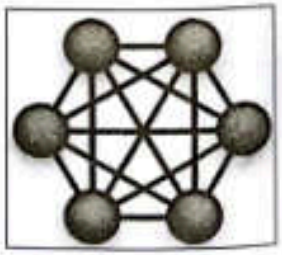
- Each node is directly connected to the ring.
- Easy to install and wire.
- Data on the network flows Book Indirection.
- Not costly to implement.

Limitations of Ring Topology

- If the ring is broken at any point, the entire network stops functioning.
- Slower than other network topologies.

Mesh Topology

In mesh topology, each node is directly connected to all the nodes as shown in Fig.



Features of Mesh Topology

- Most reliable network topology.
- Data can be routed around failed computers or busy ones.
- Can manage high traffic.

Limitations of Mesh Topology

- Most expensive topology to implement.
- Setup and maintenance is very difficult.

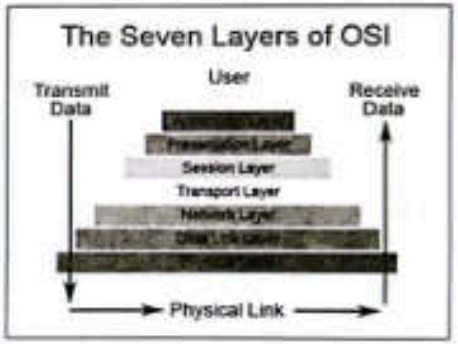
Q.18: What is OSI model? Discuss its layer in details.

Ans: OSI model

The International Standards Organization (ISO) based in Geneva, developed standards for international and national data communications. In the early 1970s, ISO developed a standard model of a data communication system and called it the Open System Interconnection.

Systems Interconnection (OSI) model:

The OSI model consists of seven layers. Each layer performs a specific task during data communication. The seven layers of OSI model are described below.



Layer 7-Application Layer

Application Layer provides services to end-user. It interacts with the operating system or application software whenever the user wants to send files, read messages or perform other network related activities.

Layer 6-Presentation Layer

Presentation Layer takes the data provided by the Application Layer and converts it into a standard format that the other layers can understand. At the receiving end it also formats the information so that it looks the way the user can understand.

Layer 5-Session Layer

Session Layer performs functions that enable two applications or two pieces of the same application to communicate across the network. It performs security, name recognition, logging and other similar functions. It also establishes, maintains and ends communication with the receiving computer.

Layer 4-Transport Layer

Transport Layer establishes connections between two computers on the network. It handles quality control by making sure that the data received is in the right format and the right order.

Layer 3-Network Layer

Network Layer decides which physical path-way the data should take to reach the destination. The communication device Router works in network layer.

Layer 2-Data Link Layer

Data Link Layer defines the format of data on the network. This layer converts the data into packets and checks them before putting them communication device Switch works in this layer. network on the path-way.

Layer 1-Physical Layer

Physical Layer defines cables and singling. It uses cables and connectors for sending and this layer. provides hardware means such as data. Cables, hubs and repeaters work in this layer.

Multiple Choice Questions

Select the suitable answer for the following Multiple choice questions.

1. Which is a general-purpose programmable machine that has the ability to store, retrieve and process data?
   (a) Slide rule (b) ABACUS (c) Computer (d) Analytical engine

2. Which generation computers used vacuum tubes and their period was from 1940 to 1956?
   (a) Second (b) Third
   (c) fourth (d) First
3. Which generation computers used transistors and their period was from 1956 to 1963.
   (a) fourth (b) Third
   (c) Second (d) First
4. Third generation computers used IC chips that were developed in early _____ .
   (a) 1960s (b) 1970s
   (c) 1980s (d) 1990s
5. Which generation computers use LSI and VLSI chips and their period is from 1971 to present?
   (a) Second (b) Third
   (c) fourth (d) First
6. Which generation of computers is concerned with development of devices that can understand natural languages and have thinking power?
   (a) Second (b) Third
   (c) Fourth (d) Fifth
7. Which one of the following will not be the type of natural system?
   (a) Aquatic (b) Grassland
   (c) Forest (d) Information
8. A complex biological system with organs, tissues, cells, and biochemical processes is the part of?
   (a) Human Body (b) Coral Reef
   (c) Solar System (d) All
9. Artificial systems, also known as _____systems, are created and designed by humans to serve specific purposes, solve problems, or achieve particular goals.
   (a) Robotics made (b) Man-made
   (c) Human-made (d) Both b, c
10. HIS stands for.
    (a) Hospital Information Series
    (b) Hospital Information Symbol
    (c) Hospital Information System
    (d) Hospital Information Servers
11. The devices, which are used to enter data and instructions into the computer, are called _____devices?
    (a) Input (b) Output
    (c) Both a, b (d) None
12. A _____is an input device used to control gaming and, on occasion, graphical applications. It was first invented by C. B.
    (a) light pen
    (b) pressure-sensitive
    (c) joystick
    (d) microphone
13. What will be the full form of CU?
    (a) Control Unit
    (b) Control United
    (c) Central Unit
    (d) Counter Unit
14. Keyboard is an _____ device.
    (a) Input (b) Output
    (c) Both a, b (d) None
15. It is a device that captures images from photographs, magazines, books etc. and stores them in computer in digital form?
    (a) Scanner (b) Microphone
    (c) Mouse (d) Keyboard
16. A_____ is the main chip on the motherboard.
    (a) Computer (b) Hardware
    (c) Microprocessor (d) System
17. Which refers to the physical components that make up a computer system?
    (a) Computer hardware (b) software
    (c) Networking (d) System unit
18. Which is a set of instructions that tells a computer what to do and how to do?
    (a) Computer hardware
    (b) Computer software
    (c) Networking
    (d) System unit
19. Which is a collection of programs which makes the use of computer easy and efficient?
    (a) Computer hardware
    (b) System software
    (c) Networking
    (d) System unit

20. Which is system software that is responsible for the management and coordination of all the activities performed by the computer?
    (a) Computer hardware
    (b) Operating system
    (c) Networking
    (d) System unit
21. _____are small memory units inside the microprocessor used to temporarily store some information during the execution of a program?
    (a) Registers (b) RAM
    (c) ROM (d) All
22. Which one is divide into main parts?
    (a) ALU (b) RAM
    (c) CU (d) None
23. The instructions given to a computer to perform a particular task is known as.
    (a) System software
    (b) Computer program
    (c) Application
    (d) Simple software
24. Which was the earliest calculating device most probably invented in China?
    (a) ABACUS
    (b) Machine
    (c) Slide rule
    (d) Napier's bones
25. John Napier, a Scottish mathematician invented a calculating device called Napier's Bone in:
    (a) 1614 (b) 1615
    (c) 1616 (d) 1617
26. Blaise Pascal, a French mathematician invented a calculating machine called:
    (a) ABACUS
    (b) Difference engine
    (c) Analytical engine
    (d) Pascaline
27. In_____, the English mathematician Charles Babbage started working on a big calculating machine about the size of a room. He called it Difference Engine.
    (a) 1823 (b) 1821
    (c) 1820 (d) 1822
28. Babbage worked for many years on difference engine but he could not complete it. Later, he came up with idea of:
    (a) ABACUS
    (b) Difference engine
    (c) Analytical engine
    (d) Pascaline
29. Who is known as the father of modern digital computers?
    (a) Howard Aiken
    (b) Jon Napier
    (c) Herman Hollerith
    (d) Charles Babbage
30. In 1890, Herman Hollerith build a tabulating machine called:
    (a) Hollerith Desk
    (b) Difference engine
    (c) Analytical engine
    (d) Pascaline
31. Based on the idea of logarithm, English Mathematician, William Oughtred developed a device called_____.
    (a) ABACUS
    (b) Difference engine
    (c) Slide Rule
    (d) Pascaline
32. In 1944 Howard Aiken invented computing machine called:
    (a) Analytical engine
    (b) Difference engine
    (c) Mark-I.
    (d) Slide Rule
33. Which devices are used to display text, graphics, and images on the monitor or to print information on paper.
    (a) Output (b) USB
    (c) Input (d) HD
34. First generation computer used:
    (a) CPU (b) Transistors
    (c) IC (d) Vacuum tubes
35. Second generation computer used:
    (a) Transistors (b) Microprocessor
    (c) IC (d) Vacuum tubes
36. Which language was used in second generation computers?
    (a) Middle language
    (b) Machine language

(c) Assembly language
(d) C++

37. Third generation computer used:
(a) Transistors
(b) Microprocessor
(c) Integrated Circuits (ICs)
(d) Vacuum tubes

38. Integrated Circuits (ICs), also known as:
(a) Semiconductor chips
(b) Conductor
(c) Full conductor (ICs)
(d) Super conductor

39. IC chip contains a large number of:
(a) Transistors
(b) Microprocessor
(c) Integrated Circuits (ICs)
(d) Vacuum tubes

40. Fourth generation computer used:
(a) Transistors
(b) Microprocessor
(c) Integrated Circuits (ICs)
(d) Vacuum tubes

41. Microprocessor was developed which resulted in the development of:
(a) Chip (b) Transistors
(c) IC (d) Microcomputers

42. Fifth generation computers are based on:
(a) Semiconductor chips
(b) Conductor
(c) Artificial Intelligence (AI)
(d) Super conductor

43. Devices used to feed data into the computer are known as.
(a) Input devices
(b) Output devices
(c) Processing devices
(d) Scanning

44. Which devices allow us to communication with the computer?
(a) Input (b) Output
(c) processing (d) Scanning

45. Which is the main input device to communicate with the computer that allows the computer users to enter letters, numbers and special symbols into the computer?
(a) Printer (b) Monitor
(c) Speaker (d) Keyboard

46. Which is a hand-held device used to control the movement of cursor or pointer on the screen?
(a) Mouse (b) Printer
(c) Scanner (d) Keyboard

47. Which is a device that allows computer user to input audio into the computer?
(a) Printer (b) Mouse
(c) Microphone (d) Keyboard

48. Which is a device that reads the barcode printed on products that represents products code, description and price?
(a) Keyboard (b) Printer
(c) Scanner (d) Barcode Reader

49. Which is a device used to capture pictures and store them in digital form?
(a) Keyboard (b) Digital Camera
(c) Scanner (d) Barcode Reader

50. Which is a pressure-sensitive display screen that is used to interact with the computer by touching pictures or words with finger?
(a) Microphone (b) Mouse
(c) Touch Screen (d) Keyboard

51. A _____ is the main chip on the motherboard that controls all the activities of the computer. It is also known as Central Processing Unit (CPU) or simply processor
(a) Transistors
(b) Microprocessor
(c) Integrated Circuits (ICs)
(d) Vacuum tubes

52. Which is the part of the computer that performs all the calculations and comparisons? It consists of arithmetic unit and logic unit.
(a) RAM (b) MU
(c) CU (d) ALU

53. Which controls the operations of the all the components of the computer?
(a) Control Unit (b) ALU
(c) CPU (d) MU

54. Which is small memory units inside the microprocessor used to temporarily store some information during the execution of a program?
(a) MU (b) AL

(c) CU (d) Registers

55. Which is the most commonly used storage device that is fixed inside the system unit?
(a) MU (b) Hard disk
(c) USB (d) CD

56. Storage capacity of CD is:
(a) 700 MB (b) 300 MB
(c) 400 MB (d) 500 MB

57. DVD stands for:
(a) Digital Versatile Disk
(b) Digital Disk
(c) Versatile Disk
(d) Disk

58. USB flash drive is a small portable drive that is connected to computer through USB port. It is also known as:
(a) USB memory
(b) Memory
(c) Simple memory
(d) Little memory

59. Information displayed on monitor is known as softcopy and anything printed on paper is known as_____ or printout.
(a) Hardcopy (b) Output
(c) processing (d) Scanning

60. Which is an output device that has a screen on which information is displayed?
(a) Printer (b) Monitor
(c) Speaker (d) Keyboard

61. Which monitor is very similar to old television?
(a) CRT (b) Monitor
(c) Speaker (d) Keyboard

62. Which monitor is slim, uses less power and has better display quality than CRT monitor?
(a) CRT (b) LCD
(c) Monitor (d) Printer

63. Which is an output device that prints text and graphics on paper which is known as hardcopy?
(a) Monitor (b) Printer
(c) Speaker (d) Keyboard

64. How many types of printer?
(a) 1 (b) 2
(c) 3 (d) 4

65. Which printer uses electro-mechanical mechanism causes the character shape to strike against the paper and leave an image of the character on the paper?
(a) Impact (b) Non Impact
(c) speaker (d) Keyboard

66. Which printer prints without striking the paper?
(a) Line printer (b) Dot matrix
(c) Speaker (d) Non Impact

67. Which is an output device used for printing engineering drawings, machine parts, building designs, maps, charts and pan flexes etc. on large size paper/sheets?
(a) Line printer (b) Plotter
(c) Speaker (d) Non Impact

68. Which is a device used to produce audio output?
(a) Keyboard (b) Digital Camera
(c) Scanner (d) Speaker

69. It stores the Basic Input/output System (BIOS) of computer that controls input/output devices and the start-up or boot process.
(a) RAM (b) ROM
(c) CD (d) SRAM

70. Which programs test the computer's components when it is turned on and then load the operating system into the RAM to make the computer ready for operation?
(a) BIOS (b) ROM
(c) DRAM (d) SRAM

71. Which is high speed memory installed on the motherboard. It is READ/WRITE memory?
(a) RAM (b) ROM
(c) CD (d) PROM

72. Which is a very small amount of extremely fast memory inside the microprocessor or on the motherboard?
(a) Cache (b) DRAM
(c) CD (d) EPROM

73. Which is an interface for connecting various devices to the system unit?
(a) Monitor (b) Application
(c) Port (d) System

74. _____are long narrow sockets on the motherboard used for installing expansion cards.
(a) Expansion slots (b) USB slots
(c) Flash slots (d) Slots

75. Which are small circuit boards?
(a) Expansion slots
(b) Expansion cards
(c) Flash slots
(d) Slots

76. How many basic operations performed by computer?
(a) 1 (b) 2
(c) 3 (d) 4

77. In which operation users enter data and instructions into the computer through keyboard or mouse.
(a) Input operation
(b) Out operation
(c) Processing operation
(d) Operation

78. _____ processes the data according to the instruction given to it
(a) Operation (b) RAM
(c) ROM (d) Microprocessor

79. Computer programs are known as:
(a) Hardware
(b) Computer software
(c) Processing operation
(d) Operation

80. An _____is system software that is responsible for the management and coordination of all the activities performed by the computer
(a) Hardware
(b) Computer software
(c) Processing operation
(d) Operating system

81. Which is a system program used to translate computer programs into machine language?
(a) Device driver
(b) Language processor
(c) Processing operation
(d) Utility programs

82. Compiler and interpreter are language processors used to translate high level language Programs into_____.
(a) Machine language
(b) Language processor
(c) Processing operation
(d) Utility programs

83. Which language is directly understood by the computer?
(a) Machine (b) Assembly
(c) High (d) Assembler

84. Which is developed for computer users to solve their problems such as preparing a letter, creating a presentation or managing a database?
(a) Machine
(b) Application
(c) Software
(d) Application software

85. Which perform specific tasks that are related to the management of the computer?
(a) Device driver
(b) Computer software
(c) Processing operation
(d) Utility programs

86. A set of rules that governs data communications. It represents an agreement between the communicating devices?
(a) Operation (b) Device drive
(c) Protocol (d) Utility programs

87. Sender is also called?
(a) Receiver (b) Sink
(c) Protocol (d) Transmitter

88. In Which mode, the communication takes place in only one direction?
(a) Simplex mode (b) Duplex mode
(c) Half Duplex (d) Full Duplex

89. In which transmission, the time interval between two characters is always the same?
(a) Synchronous (b) Asynchronous

(c) Both a, b (d) None

90. How many network topologies are available?
(a) 2 (b) 4
(c) 5 (d) 6

ANSWERS

1.	c	2.	d	3.	c	4.	a	5.	c	6.	d	7.	d
8.	a	9.	d	10.	c	11.	a	12.	c	13.	a	14.	a
15.	a	16.	c	17.	a	18.	b	19.	b	20.	b	21.	a
22.	a	23.	b	24.	a	25.	d	26.	d	27.	d	28.	c
29.	d	30.	a	31.	c	32.	c	33.	a	34.	d	35.	a
36.	d	37.	c	38.	a	39.	a	40.	b	41.	d	42.	c
43.	a	44.	a	45.	d	46.	a	47.	c	48.	d	49.	b
50.	c	51.	b	52.	d	53.	a	54.	d	55.	b	56.	a
57.	a	58.	a	59.	a	60.	b	61.	a	62.	b	63.	b
64.	b	65.	a	66.	d	67.	b	68.	d	69.	b	70.	a
71.	a	72.	a	73.	c	74.	a	75.	b	76.	d	77.	a
78.	d	79.	b	80.	d	81.	b	82.	a	83.	a	84.	b
85.	d	86.	c	87.	d	88.	a	89.	a	90.	b		

Short Questions Answers

Q.1: What is a computer? Briefly describe the working of computer processing system.
Ans: A computer is an electronic machine that processes data and converts it into information. Computer is an advanced electronic device that takes raw data as input from the user and processes it under the control of set of instructions (called program), gives the result (output), and saves it for the future use.

Functions of computer
It has the ability to store, retrieve and process data. It processes data at very high speed according to the instructions given to it and produces accurate results.

Computer program
Computer program is a set of instructions given to the computer to solve particular problems. Computer program specifies a sequence of operations that computer will perform.

Q.2: Describe the ABACUS.
Ans: ABACUS was a first counting device made by Chinese near about 5000 years ago. It consisted of a wooden frame having parallel rods. These rods had a number of wooden beads which could slide freely along the length of rods. While performing calculations, beads were moved up and down with fingers. Abacus was used to perform addition, subtraction, multiplication and division.

Q.3: What do you know about Pascaline?
Ans: Blaise Pascal, a French mathematician invented a calculating machine called Pascaline in 1642. Pascal invented a machine that had a system of gears. Pascaline used rotating wheels. Each wheel had ten parts having digits from 0 to 9.

Q.4: Describe difference engine and analytical engine.
Ans: Difference Engine: In 1822, Charles Babbage invented a machine called "Difference Engine". Difference Engine was intended to be steam powered and fully automatic, including printing of the results.
Analytical Engine: Babbage worked for many years on difference Engine but he could not complete it. Later, he came up with idea of Analytical Engine. It was a general-purpose programmable computing engine. The Analytical Engine has many essential features found in the modern digital computer.

Q.5: Why is Charles Babbage called father of computer?
Ans: In fact Babbage's machine gave birth to the research in the field of computers. The modern computers are largely based on the principle developed by Charles Babbage. That is why Babbage is considered as 'Father of Modern Computer'

Q.6: What do you know about Hollerith desk?
Ans: In 1890, Herman Hollerith builds a tabulating machine called Hollerith Desk. This machine was invented to help with the census of 1890 in America. Hollerith Desk consisted of a card reader which sensed the holes in the cards, a gear driven mechanism which could count and a large set of dial indicators to display the results.

Q.7: Describe Mark 1 by Howard Aiken.
Ans: It was invented by Howard Aiken in 1944. Mark-I could add three numbers having eight digits in one second. It could print out its results on punched cards or on an electric typewriter. Mark-I was 50 feet long, 8 feet high and weighed about 5 tones. It used 3,000 electric switches.

Q.8: Write down some characteristics of first generation of computers.
Ans: The following are the characteristics of first generation computers.

- First generation computers used vacuum tubes.
- Speed was slow and memory was very small and they were huge in size
- First generation computers were very expensive and unreliable and they consumed a lot of power and generated a lot of heat.

Examples: Some examples of first generation Mini/Mainframe computers are ENIAC, UNIVAC I, IBM 604, Mark-I and EDVAC.

Q.9: Write down some characteristics of Second generation of computers.
Ans: The following are the characteristics of second generation computers.

- Transistors were used instead of vacuum tubes.
- Transistors reduced the size of computers and increased the speed and memory capacity.
- Computers became more reliable and cheaper.
- Second generation computers used punch card readers, magnetic tapes, magnetic disks and printers.

Examples: Examples of second generation computers are UNIVAC II, IBM 7030, 7780 and 7090, NCR 300 series, General Electric GE 635 and Control Data Corporation's CDC 1604 computers.

Q.10: Write down some characteristics of third generation of computers.
Ans: The following are the characteristics of third generation computers.

- Third generation computers used IC chips.
- IC chips improved the speed and memory of computers.
- Computers consumed less electricity, became smaller, cheaper and more reliable than second generation computers.

Examples: Some examples of third generation computers are Honey well-6000 series, PDP, IBM System/360 and Control Data Corporation's 3300 and IBM-370/168.

Q.11: Write down some characteristics of fourth generation of computers.
Ans: The following are the characteristics of fourth generation computers.

- Fourth generation computers used microprocessor.
- Microprocessor was developed which resulted in the development of microcomputers.
- Fourth generation computers are very fast, have large storage capacity and use advanced input/output devices.

Examples: Some examples of microprocessors developed in fourth generation of computers are Intel Pentium series, Dual Core, Core 2 Duo, Core i3, i5, i7 and AMD Athlon.

Q.12: Write down some characteristics of fifth generation of computers.
Ans: The following are the characteristics of fifth generation of computers.

- Fifth generation computers are based on Artificial Intelligence (AI).
- In fifth generation of computers, AI will minimize the need to write programs.
- These computers will allow users to give commands in any natural language such as English.

Examples: Examples of fifth generation computers are robots and expert systems.

Q.13: What is a system?
Ans: A system is a collection of interacting or interrelated pieces that follow a set of rules to form a coherent whole. A system, surrounded and impacted by its environment, is defined by its boundaries, structure, and purpose, which are expressed through its operation. Systems are the subjects of systems theory and other related studies.

Q.14: What do you mean by Ports?
Ans: A port is a virtual place where network connections begin and stop. Ports are software-based and controlled by a computer's operating system. Each port is connected with a particular process or service.

Examples
• USB port •HDMI port •VGA port

Q.15: What is Expansion slot?
Ans: An expansion card, also known as a circuit board, is inserted into an expansion slot on the motherboard to add capabilities like memory, video, sound, enhanced graphics, Ethernet, and more to a computer.
Examples

- **AGP (Accelerated Graphics Port) for video card**
- **PCI (Peripheral Component Interconnect) for network card, SCSI, Sound card, Video card**
- **ISA (Industrial Standard Architecture)**

Q.16: What is Expansion Card?
Ans: An expansion card, often called an add-on card, is used to enhance an already-existing feature, such sound or video, or to add new capabilities to the system. An expansion card could be a **dedicated GPU, network card,** or **sound card**, for instance.

Q.17: Define Bus Architecture.
Ans: The bus design strikes an effective balance between point-to-point topologies, which are overly decentralized, and hub-and-spoke architectures, which are overly centralized.
Types of Buses
Data Bus: It carries the actual data being transmitted.
Address Bus: It specifies the location in memory or I/O device where data should be read from or written to.
Control Bus: It carries control signals that manage the data transfer process.

Q.18: What do you know about Registers?
Ans: Registers are small memory units inside the microprocessor used to temporarily store some information during the execution of a program.
Examples: Some commonly used registers are Instruction Register, Accumulator Register, Data Register and Memory Address Register (MAR).

Q.19: What is computer memory hierarchy?

Ans: To increase data transmission, modern computers use a memory hierarchy. Data is stored at various levels of memory, ranging from fast but small cache memory to larger and

Fig. Memory Hierarchy

slower RAM.

Q.20: Describe the responsibilities of Parallelism architecture.

Ans: Parallel computer architecture opens up new possibilities for computer system development by utilizing an increasing number of processors. In principle, the performance produced by utilizing a large number of processors is superior to the performance of a single processor at any given time.

Q.21: Describe memory units.

Ans: Memory Units

The memory unit represents the quantity of data that can be stored in the storage unit. This storage capacity is stated in bytes.

System of Units (SI)		
Factor	Name	Symbol
10^3	kilobyte	KB
10^6	megabyte	MB
10^9	gigabyte	GB
10^{12}	terabyte	TB
10^{15}	petabyte	PB
10^{18}	exabyte	EB
10^{21}	zettabyte	ZB
10^{24}	yottabyte	YB

Below explains the main memory storage units.

Bit (Binary Digit)

A binary digit is logical 0 and 1 representing a passive or an active state of a component in an electric circuit.

Nibble

A group of 4 bits is called nibble.

Byte

A group of 8 bits is called byte. A byte is the smallest unit, which can represent a data item or a character.

Word

A computer word, like a byte, is a group of fixed number of bits processed as a unit, which varies from computer to computer but is fixed for each computer.

Q.22: Describe magnetic memory or Hard disk.

Ans: Hard disk is an example of secondary storage device, which is used to store digital data permanently. A hard disk is a magnetic storage device used to store computer data. It has storage capacity of hundreds of Gigabytes (GB). It is fixed inside the computer casing. Portable hard disk is also available that is attached to USB port.

Q.23: What is Optical memory?

Ans: Optical storage refers to any sort of storage in which data is written and read using lasers. Typically, data is written on optical medium such as CDs and DVDs. Optical discs were once thought to be a viable replacement for hard disk drives (HDDs) in computing systems, but their slow capacity growth in comparison to both (HDDs) and later flash-based solid-state drives (SSDs) has relegated optical storage to long-term archiving and data backup.

Q.24: Define Memory.

Ans: Memory is the electronic holding place for the instructions and data a computer needs to reach quickly. It's where information is stored for immediate use. Memory is one of the basic functions of a computer, because without it, a computer would not be able to function properly.

Q.25: Describe RAM.

Ans: RAM is the primary storage device and the data and instructions are stored temporarily in it. It is also called volatile memory. It is addressable memory. The contents of the RAM are lost when we shutdown the Computer.

Q.26: Describe ROM and BIOS program.

Ans: ROM stands for Read Only Memory. It is a non-volatile memory. Data stored in ROM are not lost when we shutdown the Computer. Data stored in ROM can be read only but new data cannot be written into it.

BIOS programs BIOS programs test the computer's components when it is turned on and then load the operating system into the RAM to make the computer ready for operation.

Q.27: What do you know about cache memory? Also describe its levels.

Ans: Cache is a very small amount of extremely fast memory inside the microprocessor or on the motherboard. It is faster and more expensive than RAM. It stores information that is most frequently used by the computer. The purpose of using cache is to improve the processing speed of computer.

Types of cache memories

There are three types of cache memories which are Level 1 (L1), Level 2 (L2) and Level 3 (L3) as L1 cache is built inside the microprocessor whereas L2 and L3 are on the motherboard. L1 cache is faster than L2 and L3 cache.

Q.28: What is software?

Ans: Software is a collection of programs and data that instructs a computer how to do specific tasks. Software often comes with accompanying documentation. In contrast, hardware is the foundation of the system and does the actual job.

Types of software: Software can be classified into the following types:

- **System software**
- **Application software**

Q.29: Describe System software.

Ans. The software used to control, monitor, or facilitate the use of the computer is called system software.

Types of system software

Following are the types of system software.

- Operating system
- Device drivers
- Utility programs
- Language processors

Q.30: What is application software?

Ans: Application Software

The Application software is a program created to perform a specific task for user. Application software is developed for computer users to solve their problems such as preparing a letter, creating a presentation or managing a database.

Types of application software

Commonly used application software are following.

- Productivity software.
- Business software.
- Entertainment software.
- Education software.

Q.31: What is Operating System (OS)?

Ans. Operating System

An operating system is a set of programs running on a computer system and providing an environment in which other programs can be executed and the computer system can be used efficiently. **Examples:** MS windows, DOS, UNIX etc

Functions of an operating system.

The following tasks are performed by the operating system.

- Manages hardware resources.
- It controls the operation of input/output and storage devices.
- It detects hardware failures and displays messages to fix them.
- Loads and executes programs.

Q.32: Describe the basic functions of Device Drivers.

Ans. A device driver is system software that controls the operation of a computer device. When users anach a device such as printer or scanner to their computer, they should install its driver also to make it operational. Device drivers are provided by device manufactures.

Q.33: Differentiate between Compiler and Assembler.

Ans: Compiler and Assembler: These tools are essential for converting high-level programming languages (like C++, Java, or

Python) into machine code that the computer's processor can understand. Compilers translate high level language code (source code) into executable programs, while assemblers do a similar job for assembly language code.

Q.34: What are the Linkers and Loaders?

Ans: Linkers and Loaders:

Linkers and loaders are programs that help with the execution of programs. Linkers combine multiple object files (compiled code) into a single executable file, while loaders load these files into memory for execution.

Q.35: What is Programming Language (PL)?

Ans: A programming language is a structured and systematic method of communicating instructions to a computer. It consists of a set of predefined commands, syntax, and rules that allow programmers to write instructions, enabling the computer to perform specific tasks or solve problems.

Q.36: What is the difference between High Level Language and Low Level Language?

Ans: High level languages are English-oriented languages and they are commonly used for writing computer programs. These languages use English language words such as print, go-to, if, end, etc. Therefore, they are easy to learn and use. Some examples of high level languages are Visual Basic, C, Java and Pascal.

Low Level Languages

Low level language is machine-oriented language. To understand low level language, detailed knowledge of internal working of computer is required. Low level languages include machine language and assembly language.

Q.37: What is the difference between primary and secondary memory?

Ans:

Primary Memory	Secondary memory
• Connected directly to the processor	• Not directly connected to the processor
• Expensive	• Cheap
• Small capacity	• Large capacity
• Fast access	• Slow access
• Examples: RAM and ROM	• Examples: Floppy disk, hard disk etc.

Q.38: How many types of control statements are available?

Types of control statements

There are three types of control statements in C language.

1. Sequential Control Statements
2. Selection Control Statements
3. Repetition Control Statements

Q.39: What do you know about Sequential Control Statements?

Ans: It means, writing program statements in a logical sequence. Each step in the sequence must logically progress to the next without producing any undesirable effects.

Q.40: What do you know about Selection Control Statements?

Ans: The statements which help us to decide which statements should be executed next, on the basis of conditions, are called selection statements.

Two types of selection statements are:

- If statement
- If-else statement

Q.41: What is Repetition?

Ans: Repetition Control Statements are used to repeat a number of statements up to a specified number of times or until a specified condition fulfilled. Some examples of structured and procedural languages are FORTRAN, Pascal, C, BASIC, ALGOL, PL/I and Ada Pascal.

There are **three types** of loops are used in C program:

• for loop • while loop • do while loop

Q.42: Define Object-Oriented Programming Languages (OOP).

Object-Oriented Programming (OOP) refers to a programming method that is based on objects such as student, vehicle, building, etc. Object-oriented programming language provides a set of rules for defining and managing objects. An object can be considered a thing that can perform a set of activities.

Q.43: What is data communication?

Ans: Data communication is the exchange of data between devices (computers) via some form of transmission medium such as wire cable, wireless system, microwave system, satellite system.

Basic Terms of Data Communication

The following terms are associated with data communication.

• Data • Digital signal
• Data transmission • Analog signal

Q.44: What is Protocol?

Ans: A protocol is a set of rules that governs data communications. It represents an agreement between the communicating devices. Without a protocol, two devices are connected but may not communicating with each other.

Q.45: Define Router and Gateway.

Ans: Router: A router connects two or more packet-switched networks, often known as sub-networks. It has two basic functions: managing traffic between these networks by forwarding data packets to their correct IP addresses.

Gateway: A gateway is a network node used in telecommunications to connect two networks that employ distinct transmission protocols. Gateways act as a network's entry and departure points.

Q.46: What is client/server network?

Ans: Client server or dedicated server network refers to a computer network in which each machine acts as a server or client. Each server computer on the network is referred to as a dedicated server. Servers are not utilized for client computing.

Q.47: Describe Virtual Private Network (VPN).

Ans: A virtual private network (VPN) is a method of establishing a secure connection between a computing device and a computer network, or between two networks, via an unsecured communication medium such as the public Internet.

Q.48: What are the characteristics of Virtual Private Network (VPN)?

- It uses public networks such as internet to connect computers.
- Provides secure remote access.
- Enables files sharing, video conferencing and similar network services.
- Provides cheap communication over long distance.

Q.49: What is the difference between Presentation and session layer?

Ans: Presentation Layer

Presentation Layer takes the data provided by the Application Layer and converts it into a standard format that the other layers can understand. At the receiving end it also formats the information so that it looks the way the user can understand.

Session Layer

Session Layer performs functions that enable two applications or two pieces of the same application to communicate across the network. It performs security, name recognition.

Q.50: What is Internet?

Ans. The internet is a global network of interconnected computer networks that allows for the exchange of data, information and communication among users and devices across the world. It is a vast and decentralized network that spans continents and connects billions of computers, servers, and other devices.

Q.51: What are the advantages & Dis-Advantages of Internet?

Ans: Advantages: The internet offers global connectivity, vast information resources, real-time communication, e-commerce, education, business opportunities, entertainment, and innovation.

Dis-Advantages: Concerns related privacy, cyber security risks, information overload, digital addition, the digital, the digital divide, online harassment, and health impacts are associated with the internet.

SOLVED EXERCISE

Multiple Choice Questions

Select the suitable answer for the following Multiple choice questions.

1. What computing machine was capable of taking input from punch cards and storing data in memory?
   (a) Abacus
   (b) Analytical Engine
   (c) Tabulating Machine
   (d) Differential Analyzer
2. What technology replaced vacuum tubes in second-generation computers?
   (a) Transistors
   (b) Integrated Circuits (ICs)
   (c) Microprocessor
   (d) Magnetic tapes
3. Which computer generation introduced the use of Integrated Circuits (ICs)?
   (a) First Generation
   (b) Second Generation
   (c) Third Generation
   (d) Fourth Generation
4. Which of the following is an example of a natural system?
   (a) Telephone network (b) Human body
   (c) Database (d) Automobile
5. Which component of the microprocessor controls the working of input /output devices and storage devices?
   (a) Arithmetic Logic Unit (ALU)
   (b) Control Unit (CU)
   (c) Memory Address Register (MAR)
   (d) Data Register (DR)
6. Which type of memory retains data even when the computer is turned off?
   (a) RAM (b) ROM
   (c) Cache (d) Register
7. What is the main purpose of Cache memory?
   (a) Store program instructions
   (b) Provide high-speed storage
   (c) Control input/output devices
   (d) Perform arithmetic operations
8. What is the smallest unit of memory in a digital computer?
   (a) Kilobyte (b) Bit
   (c) Byte (d) Megabyte
9. Which memory type uses laser beams to read and write data?
   (a) RAM (b) Optical memory
   (c) Cache memory (d) ROM
10. In Von Neumann architecture, where are instruction data and program data stored?
    (a) In separate memory units
    (b) In the same memory unit
    (c) In the processor's registers
    (d) In the cache memory
11. What is the primary function of the buses in a computer's memory system?
    (a) Control memory operations
    (b) Display graphic
    (c) Transmit data between components
    (d) Perform arithmetic operations
12. What is the primary function of the Presentation Layer in the OSI model?
    (a) Establishing connections between computers
    (b) Converting data into a standard format
    (c) Deciding the physical path of data
    (d) Sending data in both directions simultaneously
13. In which network topology is data transmission unidirectional, like radio or television broadcasts?
    (a) Star Topology (b) bus topology
    (c) Mesh Topology (d) Ring Topology
14. Which data communication standard is used for transferring web pages and related data on the World Wide Web?
    (a)TCP/IP (b) HTTP
    (c) FTP (d) SMTP
15. Which network architecture requires each computer to act as either a server or a client but not both simultaneously?
    (a) Client/Server Network
    (b) Peer-to-Peer Network
    (c) Metropolitan Area Network (MAN)
    (d) Wide Area Network (WAN)

ANSWERS

1.	b	2.	a	3.	c	4.	b	5.	b
6.	b	7.	b	8.	b	9.	b	10.	b
11.	c	12.	b	13.	d	14.	b	15.	b

Short Questions Answers

Q.1: What is the function and significance of Napier's Bone in early computing?
Ans: John Napier developed Napier's bones, a manually operated calculating device. It used 9 separate strips (bones) marked with numerals to multiply and divide. It was also the first machine to calculate using the decimal point system.

Q.2: How did Charles Babbage's Difference Engine differ from the Analytical Engine?
Ans: Difference Engine:
In the early 1820s, Charles Babbage created the Difference Engine. It was a mechanical computer that could do basic computations. It was a steam-powered calculating machine used to solve numerical problems.

Analytical Engine
Charles Babbage created another calculating machine, the Analytical Engine, in 1830. It was a mechanical computer that took input from punch cards. It was capable of solving any mathematical problem and storing data in memory.

Q.3: What is the primary goal of fifth-generation computers?
Ans: The main objects of fifth generation of computers is to develop devices that can understand natural languages and have thinking power. This is a big challenge for computer developers and programmers to design such systems and software for them.

Q.4: Name the three types of memory mentioned on the motherboard in the Von Neumann architecture?
Ans: Central Processing Unit (CPU)
The Central Processing Unit (CPU) is the main electronic circuit responsible for executing the instructions of a computer program. The CPU contains the ALU, CU and a variety of registers.
Registers:
Registers are high speed storage areas in the CPU. All data must be stored in a register before it can be processed.
Arithmetic and Logic Unit (ALU):
The ALU allows arithmetical (add, subtract etc.) and logical (AND, OR, NOT et(c). operations to be carried out.

Q.5: Differentiate between volatile and non-volatile memory.
Ans: Volatile memory:
Volatile memory is a temporary memory, that requires power (electricity) to maintain the stored information. Volatile memory retains the information as long as power supply is on, but when power supply is off or interrupted the stored memory is lost. It is also known as temporary memory. Examples

of such memory are RAM (Random access memory), Cache memory and Registers.

Non-Volatile memory:

Non-volatile memory is a permanent memory, that can retain the stored information even when powered off. Examples of non-volatile memory include ROM (Read-only memory), flash memory, magnetic storage devices (e.g., hard disks and magnetic taps), optical disks, and blue-ray disk. Non-volatile memory is typically used as secondary storage for long-term or future use.

Q.6: Show memory hierarchy with the help of diagram.

Ans:

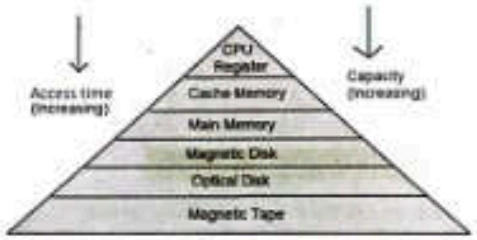


Fig. Memory Hierarchy

Q.7: Why is the word size of a processor important diagram, and how does it affect the computer's performance?

Ans: Word size:

Word size refers to the number of bits that computer's CPU can process or manipulate in a single instruction or operation. The word size of a CPU is a fundamental characteristic that affects its performance and capabilities.

Q.8: What is pipelining, and how does it improve the efficiency of a CPU?

Ans: Pipeline Processing:

Many modern CPUs pipelining to increase efficiency. In a pipeline, multiple instructions are in different stages of execution simultaneously. This allows for better utilization of the CPU's resources and faster execution of instructions.

Q.9: Imagine you are building a custom computer for a friend. Give three considerations you would take into account when choosing the type and size of memory for this computer.

Ans: Building your own computer can seem like a difficult task, especially for a first-timer. You would be concerned that it is too complicated, expensive, or time-consuming, but it does not have to be!

- The five areas of hardware you'll need to research for any PC build are:
- Motherboard
- Memory (RAM)
- Processor/Central Processing Unit (CPU)
- Storage (SSD)
- Case, fans and power supply

Q.10: You are a computer technician tasked with upgrading an older computer with a slow CPU. How might you improve its performance without replacing the entire CPU?

Ans: That depends on what you understand by "computer". Putting the old items in a new box will not accomplish anything. Upgrading the HDD can have an impact, particularly if the upgrade is to an SSD.

CPU? Not really achievable. A better CPU will require a different socket, which is soldered to the motherboard. Furthermore, an outdated motherboard may not be able to handle the capabilities of the new CPU.

Q.11: Your school is planning to purchase new printers for the computer lab. Give three advantages and disadvantages of impact and non-impact printers to help them make a decision.

Ans: The printing speed varies from 50 to 500 cps (characters per second). Their printing is very cheap but print quality is poor. They produce lot of noise while printing. These printers are still in use for printing invoices, bank statements, utility bills, etc.

Impact Printers		Non-impact	
Advantage	**Dis-advantages**	**Advantage**	**Dis-advantages**
i) Cast-effective ii) Carbon copies iii) Reliability	i) Noise ii) Lower print quality iii) Limited media compatability	i) High quality ii) Quiet operation iii) versatility	i) Cost ii) Complexity iii) Durability

Q.12: Define "protocol" in the context of data communication.

Ans: Protocol:

A protocol is a set of rules that governs data communications. It represents an agreement between the communicating devices. Without a protocol, two devices are connected but may not communicating with each other.

Q.13: Define simplex, half-duplex, and full-duplex modes of communication with one example each.

Ans: Simplex mode:

In simplex mode, the communication takes place in only one direction. In this mode communication is unidirectional, i.e. the communication can only take place in one direction and it is not possible for the receiver to send data back.

Half-duplex mode

In half-duplex mode, the communication takes place in both the directions but not at the same time. The signal can only be sent or received at one time.

Full-duplex mode:

In full-duplex mode, the communication takes place in both the directions at the same time. In this mode, both sender and receiver can send and receive the data simultaneously.

Q.14: What are start and stop bits, and where are they used in data transmission?

Ans: Start and Stop bits are used in asynchronous transmission. These bits provide timing (synchronization) for the connection between the sender and the receiver.

Q.15 How does a switch differ from a hub in a network?

Ans: Hub:

Hub is a connectivity device used in LAN. It connects multiple LAN devices on one network and makes them act together as a single network.

Switch:

Switch is a networking device that performs the same job as the hub but are considered as intelligent than hub.

Q.16: How does asynchronous transmission differ from synchronous transmission, and in what situations are they typically used?

Ans: Asynchronous transmission:

In asynchronous transmission, the time interval between two characters is very variable and not fixed. The computer devices can exchange information at their own rate, slow or fast.

Synchronous transmission:

In synchronous transmission, the time interval between two characters is always same. In this method tow communicating devices are synchronized and they continue to send characters in order to remain synchronized, even if there is no data to be transmitted.

Q.17: Explain the concept of a peer-to-peer network and its limitations compared to a client/server network.

Ans: In Peer-to-Peer networks, every computer is capable of playing the role of client, server or both at the same time. In this network each computer on the network is referred to as peer. In a peer-to-peer network, a

peer computer can act as both a server and a client at the same time.

Q.18: Compare and contrast the star and ring network topologies.

Ans: Star Topology:

In a star network topology, each network node is connected to a central device called a hub. Large networks can require many hubs and hubs can be connected to each other to create a single large network. Star network topology.

Features of Star Topology:

- It is suitable for both small and large networks.
- Easy to install and write.
- Easy to detect and remove faults.
- Failure of cable does not stop functioning of the entire network.

Limitations of Star Topology:

- Failure of the hub causes the entire network to go down.
- Expensive topology to implement. Lengthy cable with a hub is required to install star topology.

Ring Topology:

Ring topology is shaped just like a ring. It is made up of a unbroken circle of network nodes. Ring network topology.

Features of Ring Topology:

- Each node is directly connected to the ring.
- Easy to install and write.
- Data on the network flows in one direction.
- Not costly to implement.

Limitations of Ring Topology:

- If the ring is broken at any point, the entire network stops functioning.
- Slower than other network topologies.

Q.19: Why is mesh topology considered the most reliable but also the most expensive to implement?

Ans: In mesh topology, each node is directly connected to all the nodes.

Features of Mesh Topology:

- Most reliable network topology.
- Data can be routed around failed computers or busy ones
- Can manage high traffic.

Limitations of Mesh Topology:

- Most expensive topology to implement.
- Setup and maintenance is very difficult.

Q.20: What is the role of the Application Layer in the OSI model?

Ans: Application layer:

Application Layer provides services to end-user. It interacts with the operating system or application software whenever the user wants to send files, read messages or perform other network related activities.

Long Questions (Exercise)

Q.1: Describe the evolution of computer generations from the first generation to the fourth generation, highlighting the key technological developments and their impact on computing.

Ans. (Long question # 2, Pg. # 2-4)

Q.2: Discuss the importance of categorizing and understanding different types of systems, both natural and artificial, and provide examples of each type.

Ans. (Long question # 3, Pg. # 4-6)

Q.3 Explain the characteristics and potential challenges associated with fifth- generation computers that aim to understand natural languages and possess thinking capabilities. What are the implications of such advancements in computing on society?

Ans. (Long question # 2, Pg. # 4)

Q.4: Explain the fundamental components of network communication, and how do they work together to facilitate data transfer?

Ans. (Long question # 14, Pg. # 17)

Q.5: Describe the roles of common communication devices like hubs, switches, routers, and gateways in data communication. How do they contribute to the functionality of a network?

Ans. Hub

Hub is a connectivity device used in LAN. It connects multiple LAN devices on one network. A network hub is a networking device that connects several devices in a local area network (LAN). It functions at the OSI model's physical layer (Layer 1), acting as a central connection point for network devices. It accepts data packets from one device and sends them to all other devices connected to the hub, regardless of whether the data is meant for a specific receiver. Hubs are deemed less efficient than switches since they do not filter packets or control traffic.

Switch:

A switch is a network component that operates on the OSI model's data link layer (Layer 2). Its principal role is to connect several devices inside a local area network (LAN) and route data packets between them using the devices' Media Access Control (MAC) addresses.

Routers

In networking, a router is a networking device that operates at the network layer (Layer 3) of the OSI model. Its major role is to join various networks and route data packets between them using network layer information such as IP addresses.

Gateway

In networking, a gateway is a networking device or software component that serves as an entry or exit point for data traffic between different networks. It acts as an intermediary that facilitates communication between devices or networks using different communication protocols, addressing schemes, or network architectures.

Q.6: Discuss the advantages and limitations of different network topologies, including bus, star, ring, and mesh. When should each topology be used in a network design?

Ans. (Long question # 17, Pg. # 19-20)

Q.7: What is the OSI model, and how does it help in understanding the process of data communication? Explain each of the seven layers and their functions.

Ans. (Long question # 18, Pg. # 21)

Q.8: Explain the evolution of the Internet from its origins to the modern-day global network. What major technological advancements contributed to its growth?

Ans.

The internet has evolved from its origins in the 1960s as ARPANET, a U.S. Department of Defense project for research institutions and military installations, to become a global network of interconnected computer network. In the 1970s the development of TCP/IP protocols established the foundation for the modern internet, allowing different networks to communicate. The 1990s saw the emergence of the world wide web and web browsers, revolutionizing how people access and share information over the internet. The 2000s mobile internet and the internet of Things (IoT). In the 2020s, the internet continues to evolve with cloud computing, artificial intelligence, and 5G technology, impacting nearly every aspect of modern life.

Several significant technological advances have led to the expansion and evolution of the Internet:

Packet Switching: The advent of packet-switched networks enabled data to be divided into packets, routed separately, and reassembled at the destination. This strategy improved network efficiency and reliability.

TCP/IP Protocol Suite: The Transmission Control Protocol/Internet Protocol (TCP/IP) evolved into the Internet's standard communication protocol, offering a common language for devices to communicate across multiple networks.

Commercialization and Privatization: In the 1990s, the Internet was transformed from a government-funded initiative to a commercialized platform, resulting in fast growth and acceptance by businesses and individuals worldwide.

World Wide Web (WWW): In 1989, Tim Berners-Lee invented the World Wide Web, which

transformed the Internet by creating a user-friendly interface for accessing and sharing information via hypertext texts and hyperlinks.

Broadband Internet: The widespread adoption of broadband technologies such as DSL, cable, and fiber-optic networks has resulted in much faster Internet speeds and bandwidth, allowing for more multimedia material and real-time communication services.

Mobile Internet: The expansion of mobile devices and wireless networks has changed the way people use the Internet, resulting in the creation of mobile apps, mobile websites, and location-based services.

Q.9: Discuss the advantages and disadvantages of the Internet, considering factors like global connectivity, information access, privacy concerns, and digital addiction.

Ans. Advantages of Internet:

Global Connectivity: Enables communication and access to information worldwide.

Information Access: The Internet provides access to a vast amount of information and resources, empowering individuals to learn, research, and acquire knowledge on diverse topics.

Communication: Email, social media, instant messaging, and video conferencing platforms enable real-time communication and interaction with friends, family, colleagues, and communities.

E-commerce: The Internet has revolutionized commerce by enabling online shopping, electronic payments, and digital transactions, offering convenience and accessibility to consumers and businesses.

Dis-Advantages of Internet

The main disadvantage of the internet includes:

- Privacy Concerns
- Cybersecurity Risks
- Information Overload
- Digital Addiction
- Digital Divide
- Online Harassment
- Health Concerns

Q.10: Explore common applications of the Internet and their impact on various aspects of society, including communication, education, business, entertainment, and research.

Ans. The Internet has become an essential component of modern civilization, revolutionizing many facets of human existence and changing the way we interact, learn, do business, enjoy ourselves, and conduct research.

Communication: The Internet provides instant communication and connectivity via email, social media, instant messaging, and video conferencing services. It allows you to communicate in real time with friends, family, colleagues, and communities all around the world, enabling collaboration, networking, and cultural exchange.

Education: Online learning platforms, instructional websites, and digital materials make it easy and flexible to learn and develop new skills. The Internet democratizes education by providing varied educational materials, courses, and tutorials on a wide range of topics, empowering students of all ages and backgrounds.

Business: E-commerce platforms, online marketplaces, and digital storefronts have transformed commerce by allowing companies to reach a global audience, broaden their market reach, and perform transactions online. The Internet enables remote work, virtual meetings, and collaboration tools, hence enhancing business productivity, efficiency, and flexibility.

Entertainment: Streaming services, gaming platforms, social media networks, and digital content

platforms provide a diverse range of entertainment alternatives, such as movies, music, video games, and interactive experiences. The Internet enables on-demand access to entertainment content, personalized suggestions, and interactive participation in online communities.

Research: The Internet provides a massive library of knowledge and resources for researchers, scholars, and professionals from numerous fields. Online databases, digital libraries, and research repositories make scholarly articles, publications, and data sets available, allowing for collaborative study, information exchange, and scientific discovery.

Lab Activities

Activity 1:

Computer history timeline presentation:

Objective: to help students understand the historical development of computer systems.

Instructions:

1. Divide the class into small groups (5 to 6 students) and assign each group a specific era or generation of computers (e.g First, Second generation etc.)
2. Instructs each group to create a presentation (using Power point or other tools) that highlights the key inventions, innovations, and characteristics of their assigned era.
3. Encourage students to include images, diagrams, and historical context to make their presentation engaging and informative.
4. Have each group present their findings to the class, creating a comprehensive timeline of computer history form early computing devices to modern computers.

Ans: Practical \ Lab Work or Class Work

Activity 2: Natural vs Artificial Systems Comparison:

Objective: To differentiate between natural and artificial systems based on the text's definitions and examples.

Instructions

1. **Provides** students with the definitions and examples of natural and artificial systems from text.
2. **Ask** students to work individually or in pairs to research and identify additional examples of each type of system beyond those mentioned in the text.
3. Have students create a visual comparison chart or poster that categorizes these examples into natural and artificial systems. They should explain why each example belongs to its respective category.
4. **Encourage** a class discussion where students share their findings and insights.

Outcomes: this activity promotes critical thinking and a deeper understanding of the concepts of natural and artificial systems.

Ans: Practical \ Lab Work or Class Work

Activity 3: Computer system components showcase:

Objective: To familiarize students with the core components of a computer system.

Instructions:

1. Set up a computer system components showcase in your classrooms with physical representations of computer components, such as a motherboard, CPU, keyboard, mouse, microphone, scanner, and other input devices.
2. Provide students with a check list or worksheet that lists these components.
3. Divide the class into small groups and assign each group to visit the showcase. Their task is to identify and describe the purpose of each component.
4. Afterward, reconvene as a class and have each group share their observations and descriptions.
5. Discuss the role of each component in a computer system and how they work together.

Outcomes: This hands-on activity enhances students' understanding of computer hardware components and their functions in a computer system.

Ans: Practical \ Lab Work or Class Work

Activity 4: Create a Data Communication Network

Objective: To understand the components and types of data communication networks.

Instructions:

1. Divide the students into groups and provides each group with a set of components mentioned in the text (Sender, Message, Medium, Protocol, Receiver)
2. Instruct each group to create visual representations of a data communication network using these components. They can use drawings, diagrams or digital tools.
3. Ask each group to label the components and explain their roles in the network.
4. Have each group present their network to the class, highlighting the type of medium they've chosen (Wired or Wireless).
5. Discuss the advantages and disadvantages of using different types of mediums in data communication.

Ans: Practical \ Lab Work or Class Work

Activity 5: OSI Model Role Play:

Objective: To understand the layers of the OSI model and their functions.

Instructions:

1. Explain the OSI model to the students, emphasizing its seven layers.
2. Assign each student or pair of students a specific layer from the OSI model.
3. Ask the students to prepare a short role play or skit in which they act out the responsibilities and interactions of their assigned OSI layer.
4. Encourage creativity in demonstrating how each layer interacts with the others.
5. Have the students perform their role plays in front of the class.
6. After each role play, discuss how the layers work together to ensure successful data communication.

Ans: Practical \ Lab Work or Class Work

UNIT 02 COMPUTATIONAL THINKING AND ALGORITHMS

Long Questions

Q.1: Discuss some computing problems in details.

Ans: Following are the computing problems:

- Decision problems
- Search problems
- Counting problems

Decision Problems: A decision problem occurs when a given input requires a binary response, either Yes or No. Responses may take various forms, such as true or false. Figure 2.1 visually illustrates a simple decision problem. In complex cases, answers extend beyond a straightforward Yes-or-No, involving multiple decision factors and criteria.

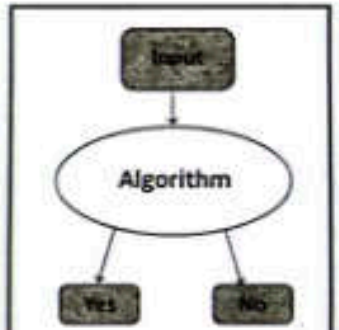


Fig. 2.1: Decision Problem

The examples of simple decision problems are:

- The problem whether a given number is odd (or even).
- The problem whether a given number is a prime number.
- The problem that is there any occurrence of "aa" "?" in a sequence x of English alphabets.

Search Problems: In science and engineering, many problems are solved using the search. In such types of problems, we have a set of objects among which we search for the solution. For example, finding a path between two cities. Search problems are often represented using graphs. Where we have nodes and where each link connects to nodes. A node can be connected to multiple nodes. To solve such problems, we have three things:

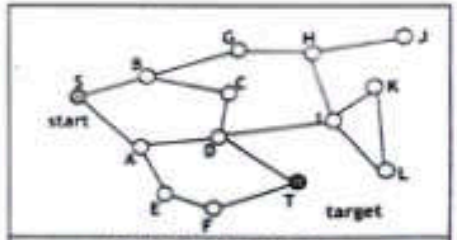


Fig. 2.2: Route Finding Problem

- **Initial State:** represents the node from where we need to start search.
- **Operations:** represents the moves that transition from one node to another.
- **Goal:** defines the target of end condition.

Example: Route Finding Problem

The map shown in Fig. 2.2 corresponds to the graph, where the nodes are assumed as cities and the links between nodes represent the routes in between the cities. The problem is to find a route in the graph from city S to city T.

Example: Eight puzzle problem

A 3×3 board is given that contains 8 tiles (every tile cancontain one number ranging from 1 to 8) and one empty space. The goal is to place the numbers on tiles
in such ordering that it matches the final configuration using the empty space. However, we also have some restrictions that we can only slide one step and only four types of slides are allowed (left, right, above, and below).

Initial configuration	Final configuration
1 2 3 5 6 7 8 4	1 2 3 5 8 6 7 4

Google Map

Counting Problems: These problems work on the principle that if an event/decision has a number of choices and another decision/event has B number of choices then the total number of possible unique combinations would be Ax B.

Let's solve counting problems.

Example: One event is numbers of shirts, and another event is number of pants you own then how many pairs of shirts and pants you can make from it.

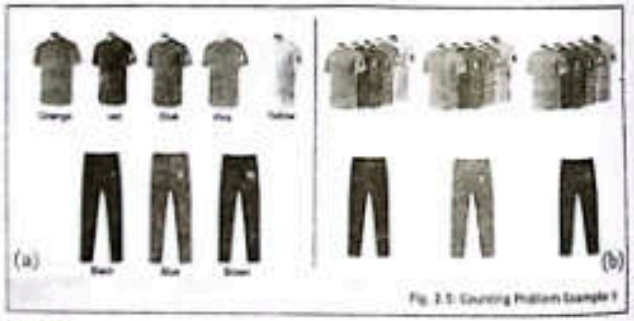


Fig. 2.5: Counting Problem Example 1

Solution

Total possible casual dresses = (number of shirts) × (numbers of pants).

Total casual dresses = 5 x 3 = 15

Solution:

Total possible casual dresses = (number of shirts) × (numbers of pants). The counting problems are normal.

Example:

You visit a computer shop to buy a computer system for you. The vender asks you to choose one of 4 monitors, one of 2 keyboards, one of 4 computers and one of 3 printers. How many numbers of possible systems you can choose from?

Solution:

You must choose 1 monitor, 1 keyboard, 1 computer and 1 printer. The below given diagram shows each component of the computer system with the number of choices you have.
For the computer system elements, we have 4 monitors, 2 keyboard, 4 computers and 3 printers. Using the counting principle, the number of all possible computer systems that you can buy is given by:

$$N = 4 \times 2 \times 4 \times 3 = 96$$

Q.2: Describe problem solving steps.

Ans: Problem solving defines the process of analyzing some situation a..l accordingly behaving to generate some response. For simple problems the following 4 steps are used.

a. Define and analyze a problem: What is the problem and why it is happening?
b. Design a plan: What we are going to do (Algorithm)
c. Implement the plan: Code it by using some programming language.
d. Evaluate: did our plan work?

However, for complex problems, the 6 steps problem solving process could be used.

a. Define and analyze a problem
b. Decompose the problem: make sub-problems that are manageable
c. Identify potential plans for each sub-problem: such as plan A, plan B and plan C
d. Select and design best plan
e. Implement that plan
f. Evaluate

Before jumping into an action for a problem, it must be thoroughly investigated to capture all the relevant aspects of the problem. For this purpose, we properly define and analyze a problem. In defining a problem, there must be clarity and the objectives of the problem must be specified.

Q.3: What is computational thinking? Discuss its properties.
Ans: Computational Thinking

Using computation to solve problems requires the ability to think in a certain way, which is often referred to as 'computational thinking'.

Importance of Computational Thinking:

Computational thinking encourages not only to reflect clearly on a problem they're solving but also to define a repeatable solution for it. While solving a problem, we don't just want to solve one instance of a problem, we want an automized system that can solve all instances of similar problem. Computational thinking can be thought of as an extension of logical thinking.

Properties of Computational Thinking:

Decomposition: Breaking down the larger problems into smaller/ manageable ones and working on them one by one. These smaller problems are referred as sub-problems. This way we simplify the problem and solve it easily.

Abstraction: By removing the unnecessary details to solution, so you could be able to identify essential information.

Pattern Recognition: Examine the problem for a pattern or similarities between previously solved problems.

Algorithm Design: This is actual designing of solution. This involves creating step- by-step plan of the problem solution.

Example: If you want to create your own computer game, how these properties of computational thinking would apply:

Q.4: What is Flowchart? Determine its requirements for the given problem or algorithm before drawing a flowchart.

Ans: Flowcharts

Flowchart is a diagrammatic representation of an algorithm. It describes what operations are required to solve a given problem.

Importance of flowchart in solving a problem:

Flowchart illustrates the sequence of operations to be performed to solve a problem in the form of a diagram. Computers programmers draw flowcharts before writing computer programs. It provides an easy way to analyze and find solutions to problems. Once the flowchart is drawn, it becomes very easy to write the program in any computer language. It is very helpful in communicating the problem-solving method to other people. It also helps in finding and removing logical errors.

Steps for drawing flowchart

The flowchart developer must determine the following requirements for the given problem or algorithm before drawing a flowchart.

- Start of the flowchart
- Input to the flowchart
- Type of processing required
- Decision to be taken
- Output of the operation
- End of the flowchart

Did You Know?

Having a clear goal helps you structure the flowchart efficiently and ensures that it serves its purpose effectively.

Start of the flowchart: Every flowchart should start with a trigger. The graphical representation of start of flowchart is oval shape.

Input to the flowchart: The flowchart designer must know what exactly the input to the flowchart is. The input is determined from the problem statement. For example, the given problem is to convert temperature from Fahrenheit to Celsius. Here, the input will be the temperature in Fahrenheit. The graphical representation of input is parallelogram.

Processing in the flowchart: The flowchart designer must decide what type of calculation is to be performed or what formula is applied to obtain the required result. For example, to find the area of a triangle. The following formula is to be used:

Area = (Base * Height) *0.5.

The graphical representation of processing symbol is rectangle.

Decision making in flowchart: The flowchart designer must decide which control structure (sequence, repetition, or selection) are to be applied for the solution of the problem. For example, selection structure must be applied to print letter grade of a student based on the marks obtained. The selection structure will check in which range the marks fall and accordingly print the grade. Graphically the decision is represented with diamond.

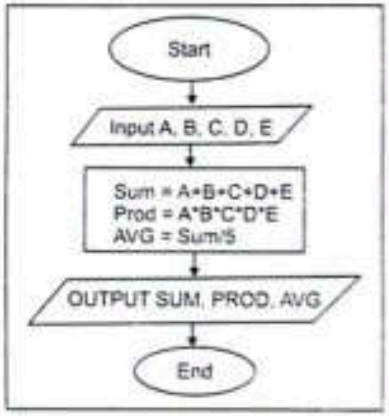
Output: The flowchart must provide the required output. The output is represented with a parallelogram symbol as well.

End of flowchart: The flowchart should have a defined end, and because of the possibility of multiple decision points, it may have multiple ends. For end of flowchart the oval symbol is used.

Flowchart to solve problems:

Flowchart 1: Flowchart to find sum, product, and average of five numbers.

From the statement of the flowchart, it is clear that sum, product and average are to be calculated and given are five numbers. The flowchart is shown below for this.



Flowchart 2: Flowchart to find the largest of three unequal numbers.

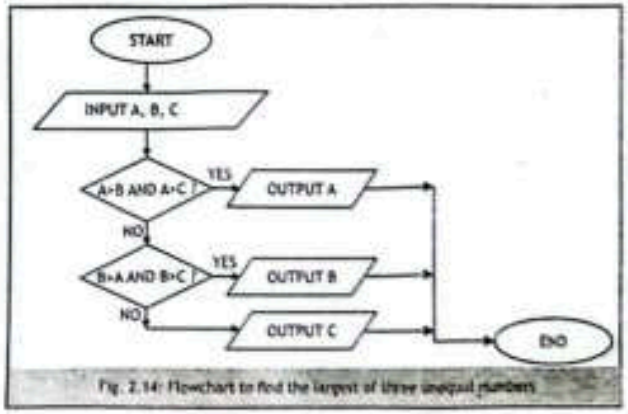


Fig. 2.14: Flowchart to find the largest of three unequal numbers

Q.5: What are Software Tools for Flowchart Designing?

Ans: Software Tools for Flowchart Designing:

For flowchart designing, different software tools are available to design the flowcharts. Some of the famous tools are Microsoft Visio and LARP software.

Microsoft Visio

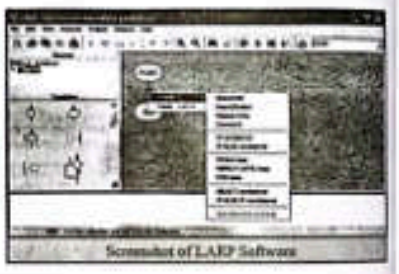
Microsoft Visio is a tool for drawing various types of diagrams such as flowcharts, building plans, data flow diagrams, network diagrams, etc.

How to create flowchart in Microsoft Visio

a) Start Microsoft Visio
b) Click on the category of Flowchart
c) Double-click the Basic Flowchart
d) For each step, you wish to design in the process, drag a relevant flowchart symbol and place itonto your drawing.
e) Connect the flowchart shapes by holding the mouse pointer over the first symbol, and thenreleasing it on the to the other symbol you wish to connect to.
f) To place text into a shape, select it,and then type.

LARP

Logics of Algorithms and Resolution of Problems (LARP) is a programming language for rapid development of prototypes. However, unlike C++, Java and other programming languages. LARP uses semi natural syntax. Therefore, it is very easy for non-programmers to understand. LARP also allows algorithms to be expressed as flowcharts. A screenshot of flowchart designing is shown in fig.



Screenshot of LARP Software

Multiple Choice Questions

Select the suitable answer for the following Multiple choice questions.

1. A_____is a challenge or situation that needs to be overcome using some action.
   (a) Problem (b) Searching
   (c) Counting (d) Both a and b
2. IPO Stands for.
   (a) Input, Processing, Output
   (b) Input, Pixel, Output
   (c) Inner, Processing, Output
   (d) Input, Picture, Output
3. How many computational problems are available?
   (a) 1 (b) 2
   (c) 3 (d) 4
4. In which problem requires a binary response either Yes or No?
   (a) Decision (b) Search
   (c) Counting (d) None
5. Which is a graphical representation of an algorithm?
   (a) Matrix (b) Graph
   (c) Flowchart (d) Solution
6. Which symbol in the flowchart is used to either start or end the flowchart?
   (a) Terminal (b) Connector
   (c) Process (d) Decision
7. Which is a matter or situation needs to be dealt with and overcome?
   (a) Algorithm (b) Problem
   (c) Flowchart (d) Debugger
8. Which consist of symbols used for graphical presentation of an algorithm?
   (a) Algorithm (b) Program
   (c) Flowcharts (d) Software
9. The diamond symbol represents the:
   (a) Input/output (b) Decision making
   (c) Processing (d) Remarks
10. In flow charts symbol ◇is used to show a:
    (a) Solution (b) Decision making
    (c) Verification (d) Test data
11. Which technique has drawn a pictorial representation of the solution?
    (a) Prototype (b) Pseudo
    (c) Debugging (d) Testing
12. What is the purpose of an parallelogram shape in flowcharting?
    (a) Decision (b) Connector
    (c) Input/output (d) Start or End
13. What is the purpose of an oval shape symbol in flowcharting?
    (a) Decision (b) Connector
    (c) Process (d) Start or End
14. How many properties of computational thinking are available?
    (a) 1 (b) 2
    (c) 3 (d) 4
15. Breaking down the larger problems into smaller/ manageable ones and working on them one by one is called.
    (a) Abstraction
    (b) Decomposition
    (c) Algorithm design
    (d) Pattern Recognition
16. There are_____ methods that are used to design a solution:
    (a) 1 (b) 2
    (c) 3 (d) 4
17. Microsoft_____ is a tool for drawing various types of diagrams such as flowcharts, building plans, data flow diagrams, network diagrams, etc.
    (a) Word (b) Excel
    (c) Visio (d) None

ANSWERS

1.	a	2.	a	3.	c	4.	a	5.	c	6.	a	7.	b
8.	c	9.	b	10.	b	11.	a	12.	c	13.	d	14.	d
15.	b	16.	b	17.	c								

Short Questions Answers

Q.1: What is computer?

Ans. A computer is an electronic machine that is used to solve problems by accepting inputs, performing operations, and presenting results. Computers cannot think but can perform those operations that are written by us in the form of algorithms and fed into the computer in the form of programs.

Q.2: Give some examples of problem in real life.

Ans. Examples: The problems are present in all fields such as economic, healthcare, education, transportation, internet and biology.

Q.3: How decision problem occurs?

Ans. A decision problem occurs when a given input requires a binary response, either Yes or No. Responses may take various forms, such as true or false. In complex cases, answers extend beyond a straightforward Yes-or-No, involving multiple decision factors and criteria.

Q.4: What do you mean by search problem?

Ans. In science and engineering, many problems are solved using the search. In such types of problems, we have a set of objects among which we search for the solution. For example; finding a path between two cities. Search problems are often represented using graphs.

- **Initial State:** represents the node from where we need to start search.
- **Operations:** represents the moves that transitson from one node to another.
- **Goal:** defines the target of end condition.

Q.5: Define counting problem?

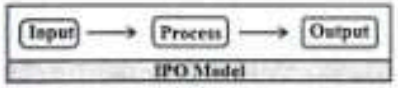
Ans. These problems work on the principle that if an event/decision has A number of choices and another decision/event has B number of choices then the total number of possible unique combinations would be Ax B.

Q.6: Give an example of counting problem with solution.

Ans. Example: One event is numbers of shirts, and another event is number of pants you own then how many pairs of shirts and pants you can make from it.

Solution: Total possible casual dresses = (number of shirts) × (numbers of pants). The counting problems are normally seen as an easy task that can immediately be done. As we go deeper, the counting problems can get complicated very quickly if we want to list out all of the possibilities.

Q.7: Discuss Input, Processing, Output (I-P-O) model with diagram.



Ans. Input: Anything that can be given to system is called input. Parallelogram symbol is used to enter data with the help of IPO model.

Processing: Operations that are performed to the system such as arithmetic operations i.e. Addition, Subtraction, Multiplication and Division.

Output: After giving and processing the data turns into the information, which is called output.

Q.8: What is Flowchart?

Ans. Flowchart is a diagrammatic representation of an algorithm. It describes what operations are required to solve a given problem. Flowchart illustrates the sequence of operations to be performed to solve a problem in the form of a diagram. Computers programmers draw flowcharts before writing computer programs. It provides an easy way to analyze and find solutions to problems.

Q.9: Which requirements must determine by the developer while creating a flowchart?

Ans. The flowchart developer must determine the following requirements for the given problem or algorithm before drawing a flowchart.

- Start of the flowchart
- Input to the flowchart
- Type of processing required
- Decision to be taken'
- Output of the operation
- End of the flowchart

Q.10: Which software tools are required for designing flowchart?

Ans. For flowchart designing, different software tools are available to design the flowcharts. Some of the famous tools are Microsoft Visio and LARP software.

- **Microsoft Visio**
- **LARP (Logics of Algorithms and Resolution of Problems)**

Q.11: How to create flowchart while using Microsoft Visio?

Ans. Following steps will be followed while creating flowchart.

- Start Microsoft Visio
- Click on the category of Flowchart
- Double-click the Basic Flowchart
- For each step, you wish to design in the process, drag a relevant flowchart symbol and place itonto your drawing.
- Connect the flowchart shapes by holding the mouse pointer over the first symbol, and then releasing it on the to the other symbol you wish to connect to.
- To place text into a shape, select it, and then type.

Q.12: How algorithm thinking works?

Ans. Algorithm thinking is about problem-solving. Computers do nothing by magic, algorithms thinking is a way of getting to a solution. It is a process that involves identifying the steps needed and then implementing those steps in a logical and efficient manner.

Q.13: Find the largest of three unequal numbers.

Ans. First we draw its IPO chart.

Input	Process	Output
Three numbers	find largest among the three numbers	Display largest number

Now we write algorithm of the process part of PO.

Step 1: Let three number be A = 10, B = 20 and C = 30
Step 2: Check if A is the largest?
Step 2.1: Check if A > B and A > C then A is the largest.
Step 3: If A is largest then stop the process, otherwise proceed to next step.
Step 4: Check if B is largest?
Step 4.1: Check if B > A and B > C then B is the largest.
Step 5: If B is largest then stop the process, otherwise proceed to next step.
Step 6: C is largest.

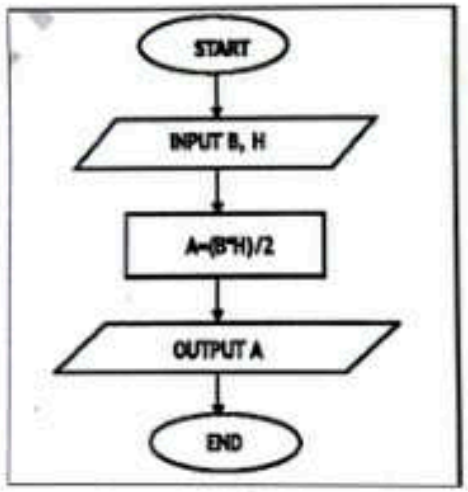
Q.14: Draw the symbols of flowchart with descriptions.

Ans. Flowchart symbols

Symbol	Name	Description
	Flow line	This symbol shows the flow of data, information or process in the flowchart.
	Terminal	An oval shape symbol that represents the Start and End of a flowchart.
	Process	A Rectangle shape symbol is used to represent the process or action taken or shows all the calculations.
	Decision	A diamond represents a decision symbol used for comparison or a decision. It changes the flow of control and decides a particular path to be followed.
	Input/output	A parallelogram represents either input or output operation regardless of the input or output method.
	Connector	A small circle represents a connector symbol and is used to join various parts of a flow chart. Connectors are used when flow chart is very large and complex and the numbers inside them identify their links. Control is transferred from one connector to another with the same number in a program.

Q.15: Draw a flowchart to find the area of triangle when the lengths of height and base are given.

Ans.



Solved Exercise

Multiple Choice Questions

1. For a problem, we face in real world situations. In what sequence we follow the steps.
   I. make some solution.
   II. understand the real-world problem.
   III. instruct the computer to behave accordingly.
   (a) I, II, III (b) I, III, II
   (c) II, I, III (d) II, III, I
2. Following are types of computing problems
   I. counting Problems
   II. search Problems
   III. decision Problem
   (a) I and II
   (b) I and III
   (c) II and III
   (d) I and II and III
3. Computational thinking is:
   a) Programming
   b) Thinking like a computer
   c) Coding
   d) Logically solving problems
4. To solve Search problems, we need to:
   (a) Provide the moves.
   (b) Provide start state.
   (c) Provide the end state.
   (d) a, b and c
5. The eight queens puzzle is the problem of:
   (a) Sorting (b) Searching
   c. Counting (d) Both a and b
6. Finding the location of thee element with a given value is:
   (a) Search (b) Traversal
   (c) Sort (d) None of above
7. In IPO Charts, we have:
   (a) Input, Plan, Output
   (b) Input, Program, Output
   (c) Input, Process, Output
   (d) Input, Proceed, Output

ANSWERS

1.	c	2.	d	3.	d	4.	a	5.	b	6.	a	7.	c

Short Questions Answers

Q.1: What is the major difference in solving simple problems and complex problems?

Ans: A simple problem becomes obvious when one person possesses the requisite knowledge expertise and experience to solve it. A difficult problem, on the other hand is visible when one person cannot possibly have all of the necessary information, expertise and experience to tackle the problem.

Q.2: Why software designers prefer to use IPO charts?

Ans: To visually represent the IPO model, we use IPO charts that represent the Inputs, Process and Output in tabular form. IPO charts are considered a handy tool that software designers use to solve problems.

Q.3: Differentiate between Computational thinking and Logical thinking.

Ans: Computational Thinking:

Using computation to solve problems requires the ability to think in a certain way, which is often referred to as 'computational thinking'.

Logical Thinking:

Logical thinking refers to analyzing a particular situation or problem using reason and accordingly reaching up to one or more decisions that are sensible. The situation analysis requires gathering of relevant facts and then deciding the best way based on the reasons.

Q.4: Write four properties of Computational thinking.

Ans: The properties of computational thinking are given below:

- Decomposition
- Abstraction
- Pattern Recognition
- Algorithm Design

Q.5: What are the methods used to design a solution?

Ans: Once you have completely understood the problem, the next stage is to design a solution. In solution design, you define how a software will meet the requirements and objectives of a problem.

There are two methods that are used to design a solution:

- **Flowcharts**
- **Concept Maps**

Q.6: Which Computational thinking technique breaks down the problem into smaller parts?

Ans: Decomposition: Breaking down the larger problems into smaller/ manageable ones and working on them one by one. These smaller problems are referred as sub-problems. This way we simplify the problem and solve it easily.

Q.7: Identify 3 computing problems from other subjects that you are studying in your class.

Ans: These problems usually have a well-defined input and some desired properties that output must be satisfied. Following are some of the computing problems:

- Decision Problems
- Search Problems
- Counting Problems

Q.8: Why do we need to think computationally?

Ans: Computational thinking encourages not only to reflect clearly on a problem they're solving but also to define a repeatable solution for it. While solving a problem, we don't just

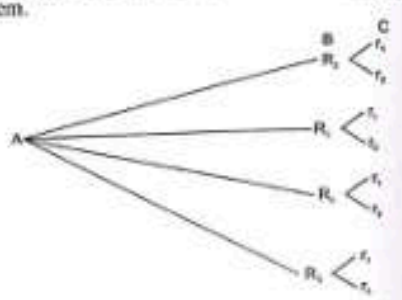
want to solve one instance of a problem, we want an automized system that can solve all instances of similar problem. Computational thinking can be thought of as an extension of logical thinking.

Q.9: The telephone numbers usually have 9 digits. Out of these 9, the first two digits represents the area code and are it remained constant within a given area. The last 7 digits represents the number, and it cannot begin with 0. How many different telephone numbers are possible with a given area code.

Ans: To determine the number of viable telephone numbers with a given area code, we must analyze the possibilities for each digit.
1. Because the first digit of the number (excluding the area code) cannot be 0, there are nine possible values (1 through 9).
2. The remaining six digits can take any value between 0 and 9, giving us ten choices for each digit.
So, the total number of different phone numbers conceivable with a given area code is:
[9 x 10^6 = 9,000,000].
This is due to the fact that each of the other six digits has ten possible values (0 through 9), and the first digit can take any value from 1 to 9.

Q.10: From city A to city B, there are 4 different roads and from city B to city C there are 2 different roads. Draw a map of given situation and identify how many possible routes are there that someone can follow to reach from city A to city C passing by city B?

Ans: Sure! Let's represent the cities as points on a map and the roads as lines connecting them.



In this map, city A is connected to city B by four roads, whereas city B is connected to city C by two roads.
To get from city A to city C via city B, we need to analyze all feasible routes from A to B and then from B to C.
There are four highways from A to B and two from B to C, hence there are eight alternative routes from A to C that pass through B.
So, there are **8** different routes from city A to city C that cross through city B.

Long Questions (Exercise)

Q.1: Identify whether the given problems are Decision Problem, Counting Problem or Search Problem. Write your answer in front of each problem given below:

a. Does a given binary string have an even number of zeros?

Ans: Binary String: A binary string is a sequence of bytes. Unlike character strings, which typically contain text data, binary strings are used to store images, speech, or mixed media. Binary strings are not assigned a code page; their code page value is 0.
To determine whether a binary string contains an even number of zeros, we simply count the number of zeros in the string and check whether the count is even or odd.
For example, the binary string "101010" has three zeros, which is an odd number, hence the answer is "no".
If the binary string is "11001100", it has four zeros, which is an even number, hence the answer is "yes".

You can count the zeros in the binary string and see if the total is divisible by two (even). If it is, the binary string has an even number of zeros; otherwise, the number of zeros is odd.

b. Flipping a coin result in Head or tails. I flip a coin 20 times, how many different sequences of heads and tails are possible?

Ans: When you flip a coin 20 times, each one can result in either heads or tails. Each flip essentially results in a binary choice.
There are two possible outcomes for each of the 20 flips (heads or tails). The total number of potential head-tail sequences is **(2^{20}).**
Let us compute it:
[2^{20} = 1,048,576]
When flipping a coin 20 times, there are **1,048,576** different head-tail sequences that can occur.

c. Does a certain Java program say "yes" to an empty input?

Ans: The design of a Java program determines whether it will say **"yes"** to an empty input. Without knowing the specifics of the program's logic, a precise answer is unattainable. In general, a Java program can be configured to accept empty input in a variety of ways. For example, it may remind the user to supply input if none is provided, or it may reject empty input and urge the user to enter legitimate information. Alternatively, the software may have a specific behavior defined for empty input, such as displaying **"yes"** or executing another action. To find out whether a certain Java program responds **"yes"** to empty input, look at its source code or documentation.

d. How many ways can the letters of the word TRIANGLE be arranged?

Ans: The word "TRIANGLE" contains eight letters, three of which are vowels. Total words: 8! = 8×7×6×5×4×3×2×1 = 40320.

Moreover

Number of words with two vowels together. We choose two vowels and then tie them together to create a total of seven letters. We must also consider the internal arrangement of the two vowels.

The number of words with two vowels combined is 3C2 × 7! × 2! = 3 × 7 × 6 × 5 × 4 × 3 × 2 × 1 × 2 = 30240.
However, we need to include terms that have three vowels.

Number of words with three vowels = 3C3×6!×3!=4320. Required number of words = 40320 minus 30240 + 4320 = **14400.**

e. N-queens problem: where the goal is to place eight queens on a chessboard such that no queen attacks any other.

Ans: The problem of placing eight queens on a standard 8x8 chessboard so that no two queens threaten each other is a well-known puzzle in the field of combinations. This problem is often solved using the concept of backtracking. The total number of distinct solutions to the eight queen's puzzle is **92**. These solutions include rotations and reflections of each other.

Q.2: A student has to take one course of physics, one of science and one of mathematics. He may choose one of 3 physics courses (P1, P2, P3), one of 2 science courses (S1, S2) and one of 2 mathematics courses (M1, M2). In how many ways can this student select the 3 courses he has to take?

Ans: Counting Principle
The fundamental counting principle states that if there are (n_1) ways to do the first task, (n_2) ways to do the second task, and (n_3) ways to do the third task, then the total number of ways to do all tasks is (n_1• n_2• n_3).
Included: -

3 physics courses (P1, P2, and P3)
2 science courses (S1 and S2).
2 mathematics courses (M1 and M2).
We just multiply the amount of options for each course.
The total number of methods is **(3 x 2 x 2 = 12)**.
So, the learner can choose the three courses in **12** different ways.

Q.3: Create an IPO chart which will accept the ages of four boys and calculate their total age and average age. The program must display both the total age and the average age.

Ans:

Input	Process	Output
Ages of four boys (integer values)	Accept the ages of the four boys as input Calculate the total age by adding up all the ages Calculate the average age by dividing the total age by the number of boys (which is 4 in this case)	Total age (integer value) Average age (floating-point value)

Q.4: Create an IPO chart of a scenario that allows a user to enter in two numbers. The operation to be performed is either addition, subtraction, multiplication or division and accordingly the output should be given to the user.

Ans:

Input	Process	Output
Two numbers (numeric values) Operation to be performed (string value indicating addition, subtraction, multiplication, or division)	Accept the two numbers and the operation as input Perform the specified operation based on the input **Addition:** Add the two numbers **Subtraction:** Subtract the second number from the first number **Multiplication:** Multiply the two numbers **Division:** Divide the first number by the second number (with appropriate error handling for division by zero)	Result of the operation (numeric value)

Q.5: The child wants to plan a birthday party for their friend.

Ans:

a) Draw an IPO chart of this situation.

Input	Process	Output
Date of the party Budget Theme preferences Venue options Guest list Food preferences/allergies Activities/games preferences	Selecting a date and time for the party Choosing a suitable venue (home, park, restaurant, etc.) Creating a guest list and sending out invitations Planning and organizing activities/games Deciding on decorations, cake, and food menu Purchasing or making necessary supplies Setting up and managing the party on the day	Successfully organized birthday party Happy birthday friend Memories created Feedback from attendees

(b) Write down properties on computation thinking.

Yes, here are some properties of computational thinking applied to arranging a birthday party for a friend.

1. Decomposition: Dividing the larger effort of organizing a birthday celebration into smaller, more manageable sub-tasks. This includes identifying and coordinating numerous factors such as venue selection, guest list creation, activity planning, and so on.

2. Pattern Recognition: Recognizing patterns or prevalent themes in birthday party planning, such as traditional activities, popular food options, or common decorations. This can assist shorten the planning process by recognizing previously successful solutions.

3. Abstraction: Concentrating on the most important aspects of the party planning process while discarding irrelevant or unnecessary information. For example, abstracting away from specific venue alternatives and focusing on the broad requirements.

4. Algorithm Design: Creating step-by-step instructions or algorithms for each stage of the party planning process. This entails taking a systematic approach to chores like as making invites, arranging activities, and putting up decorations.

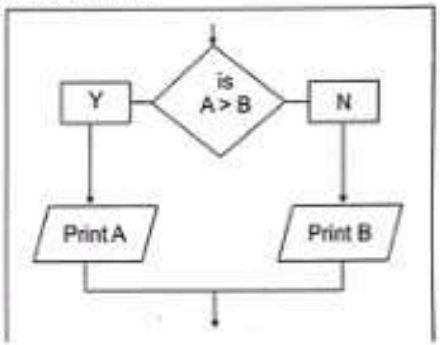
5. Evaluation: Assessing and evaluating various choices and conclusions during the planning process. This may include taking into account money constraints, scheduling constraints, and the preferences of the birthday friend and other visitors.

6. Generalization: Using insights and learning from prior party planning experiences to enrich and improve the planning process. This entails applying previously effective tactics and solutions to new contexts.

7. Debugging: Identifying and resolving issues that develop throughout the planning process. This may include fixing scheduling, finance, or logistics concerns to ensure the party plan is carried out successfully.

Solved Lab Activities

Activity 1: draw a flowchart in MS Visio that takes input of two numbers A and B and output TRUE if A is greater than B otherwise it should output FALSE.
Solution: If A>B then print A else print B



Where Print A= TRUE & Print B= FALSE
Activity 2
Draw IPO chart and algorithm for the following:
a) Find the expression of a given number: exponent or power of a number means how many times to use the number in a multiplication. In other words, it is the product of a number that is multiplied as many times as the exponent.
Ans:

Input	Process	Output
The expression e^4 , enter the value of e. i.e e=2	$P = 2^4 = 2*2*2*2=16$	Finally, result is P= 16

1. Start with expression.
2. Enter the value of e to calculate exponent or power.
3. Value of P will be 16.
4. The finally result is 16.

b) Print odd numbers from 1 to 100. Such as: 1 3 5 ...99

Input	Process	Output
Set a variable num to 1	Iterate from 1 to 100 Check if the number is odd	Odd numbers from 1 to 100 1 3 5 ...99

c) Print the following sequence of numbers in descending order.
27 24 21 18 15 12 9 6 3 0 -3 -6

Input	Process	Output
Set a variable i to 27	Start from 27 and decrement by 3 until reaching -6	Descending order from 27 to -6 27 24 .... -3 -6

d) Find the sum of even numbers up to 100.

Input	Process	Output
Set sum to 0	If sum%2==0.the number is even. Add the number to the sum. Or Sn = n(n+1)	Display the sum Sn = 50(50+1) = 50 x 51 = 2550

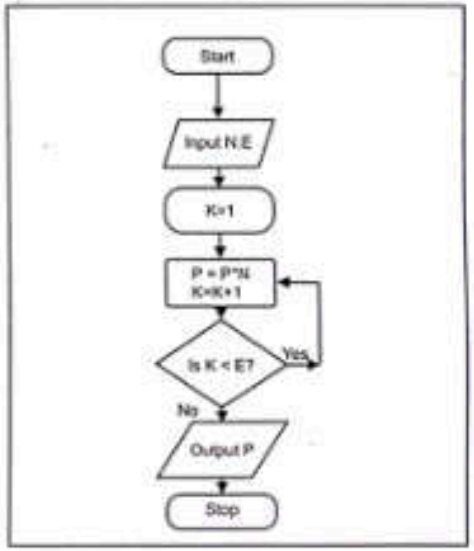
e) Print a multiplication table of a given number.

Input	Process	Output
Enter the value of N to I	Iterate from 1 to 10. Multiply each number by N and print the result	Print the product.

Moreover
1. Initialize a variable i to 1.
2. Use a loop to iterate from i = 1 to i = 10.
3. In each iteration, calculate the product of i and n.
4. Print the product.
5. Increase the value of i by 1.
5. Repeat steps 3 to 5 until i is greater than 10.

This algorithm takes an input 'n' and uses a for loop to iterate from 1 to 10. Inside the for loop, it calculates the product of 'n' and the current value of i, and then prints it using the print function.

Activity 3
Convert the algorithms of Lab activity given in Q 2 to flowcharts.
a) Find the expression of a given number: exponent or power of a number means how many times to use the number in a multiplication. In other words, it is the product of a number that is multiplied as many times as the exponent.
Ans.



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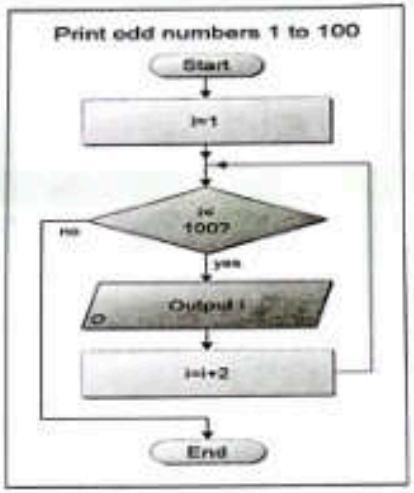
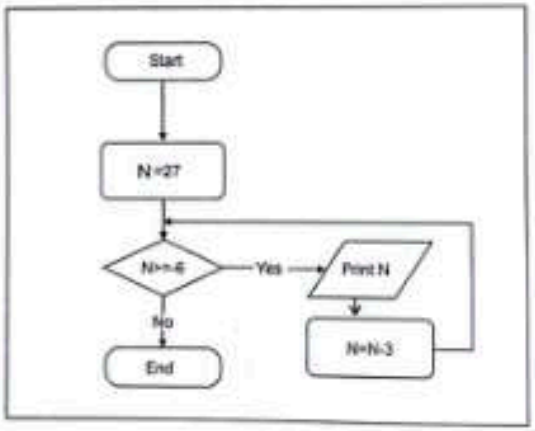
Ans.



c) Print the following sequence of numbers in descending order.

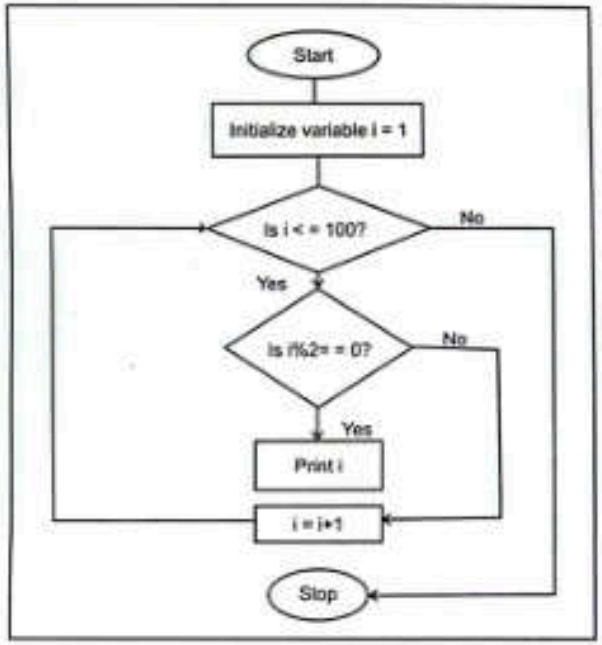
27 24 21 18 15 12 9 6 3 0 -3 -6

Ans.



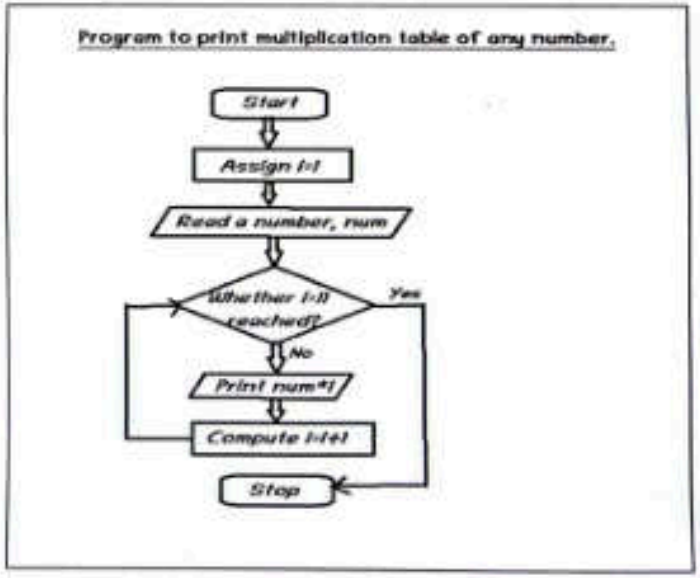
d) Find the sum of even numbers up to 100.

Ans.



e) Print a multiplication table of a given number.

Ans.



UNIT 03

PROGRAMMING FUNDAMENTALS

Long Questions

Q.1: Discuss WWW in details.

Ans: The World Wide Web's (WWW) development has made it easier to share information and data in many formats, which is becoming more prevalent and essential in our everyday lives. Documents, picture, audio, video are the main types of information but not limited to. Especially, with the rise of social media, the links and tags of information enable you to share and search related information on the internet. Additionally, the dynamic nature allows changing the contents for individuals and group of peoples. For example, the contents of the website remain same whoever visits it, but after logging in as a member customized data is shown.

Web and Website

A document which exists and is accessible through internet is a webpage, while a set of webpages is termed as Website. For example a news website Associated Press of Pakistan as shown in figure 1, has different sections and each one of them has at least one webpage in every section. To access a webpage, software namely web browser is used. You just provided in the Universal Resource Locator (URL) in the website which is the generally accessible address of the document. This way, web browser will locate the document and display it.

Fig. Website of Pakistan's Official News Agency

In case, you are unable to recall the URL of the website you are searching, help of search engines is quite useful. Search engine provides the service to seek relevant information based on the keywords you have entered. The search engine on the basis of keywords creates different combinations and searches the relevant information.

The point to note is that every website has a 'Homepage'. As soon as a webpage opens up, its homepage is displayed and thereafter you can navigate the website to extract information. Every website and relevant pages need to be uploaded to a web hosting services, which offers web servers that are available around the clock.

Q.2: Discuss the following terms in details:

- **Web Application**
- **Website Development**
- **Static Website**
- **Dynamic Website**

Ans: Web Application:

A computer program which offers a service or executes tasks via a browser and internet connection, remotely accessing a serving, is called web application. Through web browser, a web application can be visited by users like a Customer Relations Management (CRM) system which handles retailing, supplies, promotions, customers feedback, etc.

Website Development

Website is the first step to show your presence in the digital world. Website only shares information and contents and does not allow any changes by the viewer. A website can have single or multiple pages linked together. For example, you can highlighting your hobbies, activities and passion.

Static Website

Regardless, how much content and how many pages you increase in your website as discussed above, the contents remain unchanged; unless you change it yourself. In other words the website is static and once accessed by the user; it will be loaded from the server where you have hosted it. After loading, on the user's computer the link to the server is no more required. Such static websites are easy to create and load on the client's site.

Dynamic Website

A website is dynamic if the information is changed or adjusted in accordance with user input or choice. For example, alteration of background color of a webpage every time a user clicks a button. So, why a website needs to be dynamic? The intention of every website owner is to have frequent visitors and the visitors should stay long. For example, online shopping sites offer promotions and packages. So that the visitors lengthen their stay on the interested page, get awareness and shop. To achieve this, dynamicity in websites is applied using scripts, like JavaScript, python, PHP, ASP, Net, etc.

Q.3: Describe the working of HTML in details. Also explain the working of installing Visual Studio.

Ans: HTML

Hypertext Markup Language (HTML) is the language used to define and display your contents in the form of a webpage. With the help of tags, you will define different contents what they are, correspondingly HTML will display them accordingly. Html identifies and provides support for every object in a webpage on the basis of tags. For example, "This is my first attempt for a webpage." Is a sentence which you want to get displayed in a web browser, so you have to put it like this:

 "This is my first attempt for a webpage."

Did You Know?
HTML (HyperText Markup Language) is not case-sensitive language.

Characters between angle brackets "<" and ">" are called tags. The said characters are as per the defined HTML rules and are one of the elements that we can use. Every component of Html is identified by a starting and terminating tag. Additionally, we have to define from where to start and end the effect of every component. Therefore, we place , the starting marker, in the start of the sentence and , the closing marker, after the sentence. Now, you have put your sentence between two tags with a component to take effect. The 'p' tag is used for paragraph/sentences.

Similarly, there are tags for everything in HTML. But, the main point to note here is that you can write your html code in a notepad and run it in a browser. There are many software/IDE environments available that help in minimizing your coding efforts. Visual Studio, Net beans, etc. For this chapter, we will be using the Visual Studio version 2022 environment, but the codes mentioned here will be applicable to any other environment.

Installing Visual Studio

For installing the latest integrated Development Environment (IDE) of Microsoft Visual Studio, visit https://visualstudio.microsoft.co m/vs/ and download the installer. The installer is an executable file (.exe extension) and you just need to double click to start the installation.

Microsoft Visual Studio is a wide-ranging IDE which can be used for writing and running code for more than 30 languages. Therefore, it allows you to choose the language environment. Once selected, click "install" and it will download and install the environment on your system (PC/ Laptop). After the installation, you can run the IDE from your system.

HTML Document Object Model

The Document Object Model (DOM) is a standard which provides mutual interpretation where grammar of a language can be associated with and can coexist on various operating systems. In HTML, every file is interpreted as a DOM-tree where hierarchy of the said file is defined. As discussed in last chapter, a tree consists of nodes and links, so is the case here where every object and component of HTML is treated as node. Hence, the file, components, features, script and even comments which exist in a web page all are treated as objects by HTML.

Q.4: Explain the Tags used in HTML

Ans: Tags in HTML:

However, since html is a tag-based programming Language, so we should recognize ourselves with the most important and frequent tags that we will encounter in the development of learning curve. With a little bit of practice, these tags will be on your fingertips, as the tags themselves are quite self-explanatory.

HTML Tag

Any html is identified with the <html> and </html> tag-pair, i.e. anything written between this tag-pair is recognized as a html document. An HTML-Document is arranged just like a simple document that you write and prepare in Notepad, Word pad or MS Word, etc., with headings, sub-headings, sentences, etc. Similar to <html> tag-pair, everything is characterized according to its respective tag-pair. The file is saved with extension .html.

Head Tag

The <head> tag-pair is defined, where tags can be placed which are not part of the main body of html, like the title of the webpage.

Title Tag

Just like every document has a name, the <tittle> tag-pair allows your webpage a name. This way, even if multiple pages or tabs are open in the browser, a webpage is easily identifiable.

Body Tag

The main part of the html is the 'body', all the main constituents of the document are arranged in the <body> tag-pair.

Tag for Headings

The headings are of different levels provided by html and there are 6 defined levels, 1 being the biggest and 6 is the smallest heading. The heading tag pair looks like <h2> ... < /h2>, for a second level heading.

Tag for Line Break

To split a sentence into multiple lines a
 tag is used. If this tag is not used between 2 sentences, and even you write the second sentence on a new line; html does not recognize this style and will put both the sentences in the same line, one after the other.

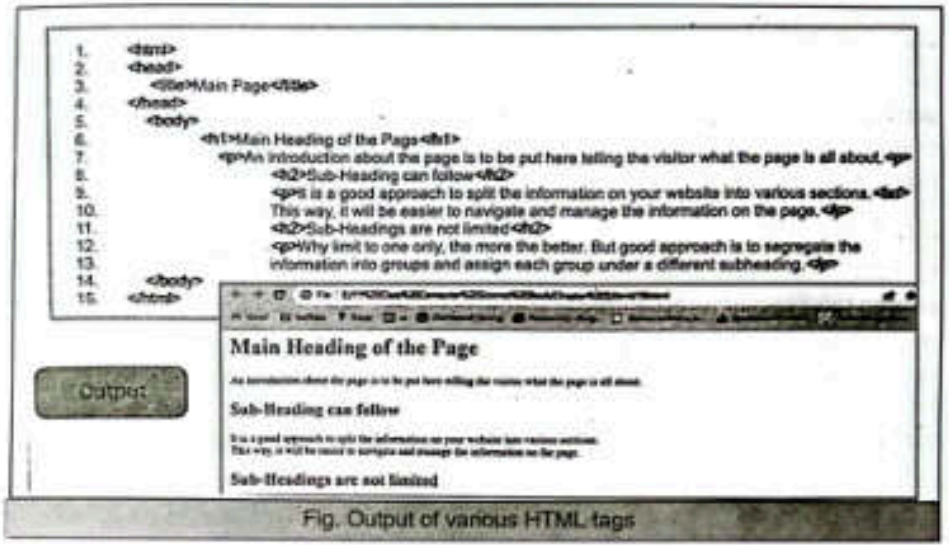


Fig. Output of various HTML tags

Tag The Text

Span is used to provide style and arrangement to a line. For multiple lines you need to assign the tag-pair on every line. Whereas, provides the same effect to a set of lines present in the page.

Bullets and Numbering

HTML treats bullets and numbering in the form of an unordered <ul> and ordered list <ol> respectively. Bullets can be of type circle, square or disc. The numbered list has the option of numbers and alphabets to choose from a word just like editor.

Q.5: Briefly discuss the role of Cascading Style Sheets (CSS) in the development of HTML pages.

Ans: Cascading Style Sheets

In the development of HTML web page the scheme, arrangement and presentation of the whole webpage along with the components are handled by a stylesheet language. There are various stylesheet languages available like Cascading Style Sheets (CSS), Document Style Semantics and Specification Language (DSSSL), Extensible Stylesheet Language (XSL), etc. The most common and frequently used with HTML is CSS. So, this way the contents of the webpage are defined through HTML while the look of different components is handled via CSS. This way, it is easier to manage and troubleshoot your web designing code for extension and digging out the errors.

Ways to use CSS in HTML webpage.

Inline CSS

Any CSS attribute that we want to incorporate can be added using a HTML tag (like the ones, we have covered in the last section) and incorporated in the body section, as shown in fig-12.

Embedded (Internal) CSS

Instead of assigning styles for every heading and other component at the time of its first

occurrence in the code, a better approach is to outline all the styles in the header under the tag-pair of 'style'. This way, all the presentation related CSS code is separated and do not indulge with the already written HTML code. Additionally, change in one line in the CSS section will be reflected throughout the respective components.

External CSS

Alternatively, a file with extension '.css' can be made and all relevant CSS code according to your schema can be present there. Once, the contents of HTML are finalized, just attach the CSS file in the head portion of HTML by passing the link. External CSS are used with large projects, like in commercial purposes.

<link rel = "mystylesheet"href="my_own_SS.css"/>

Decorating Tables with CSS

By using CSS, you can provide borders in table as well. For this purpose, we initially need to state the 'style' tag-pair just before the start of table and later inside the block, we need to set which style to opt for and where to apply it. As shown in the following code, we are defining border for table, table header cells and every other cell in the table. Other than that, we can also designate a background color for the table.

Q.6: How to add video clip in a website? Explain with the help of example.

Ans: Adding a Video Clip in Website

To add a video clip in a website, <video> tag is used where you can define the clip size and how the clip should be available at the time when website loads up. Line 7 of the code uses a video tag and specifies width and height of the clip in terms of pixels to adjust the size of the video clip. Additionally, the controls parameter defined that play/pause and volume controls are enabled when the video loads up. In the next line, the source and type of the video are specified. Though, Html supports many formats, but among different browsers the most commonly supported video type is MP4.

Alternatively, auto-play parameter can be used instead of controls. Auto-play automatically loads the video clip as the webpage loads but does not provide any controls for volume or play/pause. Auto-play can be used by specifying additional features like muted, looped, etc. When muted is used, the clip loads but volume is muted and needs to be unmuted manually while looped will keep the clip running, again and again in a loop, unless it is interrupted manually. Options for manual intervention are accessible by right-clicking the mouse. **Example code:** <video width= "500px" height="500px"autoplay muted>

Q.7: What do you know about Java Script? Describe in details.

Ans: Java Script

Java script is an exciting language primarily used in development of web pages and scripts. It does not consume much of memory and that is why it is used at the client-end in developing websites for making pages dynamic. It easily works with programming languages like Java and HTML, on any operating system.

Let's Meet Java script

Java script code can be embedded in HTML with starting and ending tag of <script>, in a webpage. There is no limitation of where to place the code inside a HTML file. For example, the following Java script code embedded in the body, displays a sentence (string) using 'document. Write ()' function.

In the sentence, displayed above we put additional spaces and tabs, which java script simply discarded. For example, we will get the same output if the statement is like the one commented on line 5.

In programming everything that a user or another program does with your program that can be sensed and triggers some task to be done, is called an 'event'. Events are important and critical in the functioning and flow-control of your program.

Java script provides to inform user, about the result of his action or notification. Event based code like 'one click' are put between the start and end of <head> tag; unlike the above example, where we put our code within the <body> tag. It allows the message to be displayed when the button is clicked.

Q.8: Explain Variables & Operators in details.

Ans: Variables

A variable is an entity that stores some value for later use. In mathematics, a variable is generally represented by a single character, but not limited to. Similarly, in programming languages, variables should be named in a meaningful manner. Additionally, the type of values the said variable can store is another important aspect. Such that the developer after defining and assigning a variable, is later able to recall about the task and type of values the said variable holds.

A variable is declared with the 'var' keyword and multiple variables can be declared in the same line of code, too. The first ever assignment of a value to a variable in the life span of program is called 'initialization'. A good programming practice is to declare and initialize the variable at the same time.

Operators

Java script supports arithmetic operators to be used which are Addition (+), Subtraction (-), Multiplication (*) and Division (/). Other than this, the Modulus (%) operator can also be used which gives remainder of a division operation.

For examples the code takes 3 variables namely, 'a', 'b' and reward. Only reward is initialized through a constant value in line 5. In line 6 and 7, remainder of reward divided by 10 is stored in 'a' and 'b' is assigned the value when reward is divided by 10, respectively.

Conditional Statement

Conditional or selection statement is an essential part of the program where amongst choices, the program chooses on the basis of some constraint. Applying an 'if' statement before one or more lines of code on the basis of some condition is met makes a typical selection scenario. That is, if the condition is met, then those line(s) will be executed otherwise skipped.

A better notion is to align both the scenarios, i.e. if condition is met and vice versa. This is achieved using an 'if-else' statement. This way, either of the two situations will definitely happen.

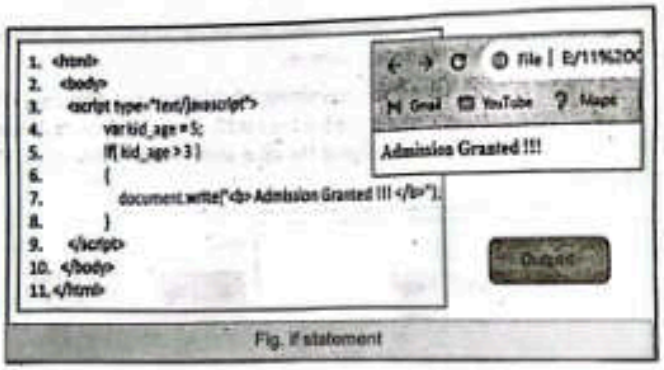


Fig. if statement

There are scenarios where more than two possibilities exist and for that reason, we can modify our selection statement to be an 'if-else' statement. This way, the set of conditions apply, first with 'if' and thereafter with 'else if' statements.

Q.9: Discuss Iterative Statement.

Ans: Iterative statement like 'For Loop' is used to get similar kind of task done. Rather than writing the same line of code multiple times, the same task is achieved in much lesser line of code. The 'for loop' works on the basis of an index, which you can initialize in the loop. Next is the terminating condition which needs to be set for the loop to terminate. Lastly, step-size needs to be defined that how many steps the index will take after each iteration; till the terminating condition is met. In the following example 'for loop', an index is initialized to 0, the value of index will increment with 1 and loop will execute till index value remains less than 10. Fig. depicts start, end and iteration of a for-loop.

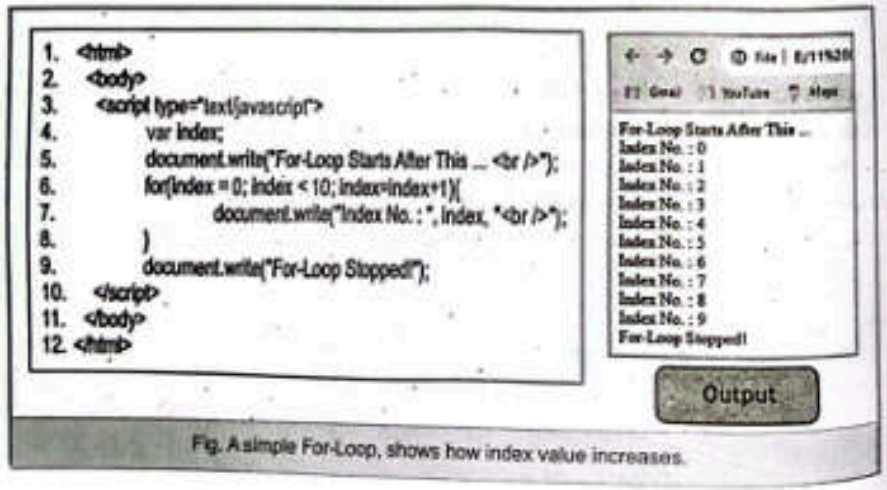


Fig. A simple For-Loop, shows how index value increases.

Q.10: Describe the working of Nested Loops. Also give an example code.

Ans: Nested Loops:

Multiple iterative tasks, if can be related then they can be incorporated in such a way that one loop can reside inside the other and are termed as 'Nested Loop'. In nested loop, initially the outer loop will start and then the inner loop will run and finish. Thereafter, the index value of outer loop will increment and the inner loop will start and end again, and so forth and so on; till the outer loop terminates. Fig. demonstrates a nested loop.

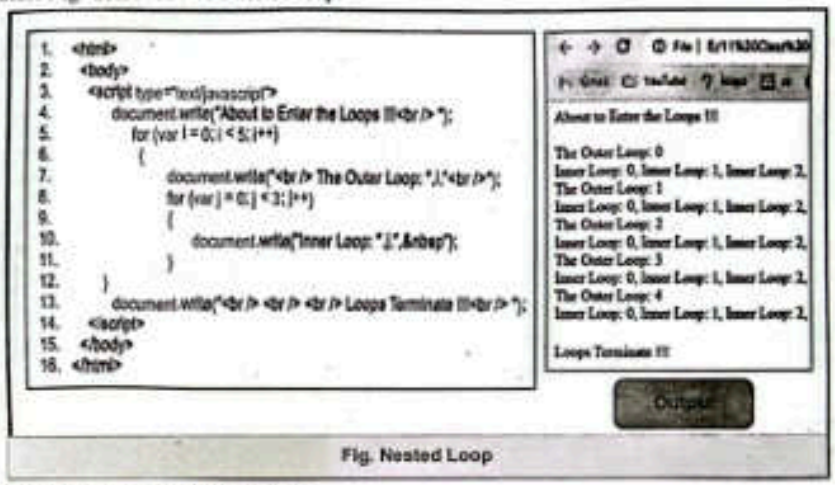


Fig. Nested Loop

Q.11: What is an Array? Explain it.

Ans: Arrays:

An array is a datatype which can hold a number of homogenous set of elements. Such that we do not need to define multiple variables of the same type like num1, num2,... num25. Instead, we can declare an array which contains 25 values. This way, we can directly access any value just by passing the respective array-index number. It is trivial to note that array-index starts with 0. Declaration of an array is of the form as shown in line 7 of fig.

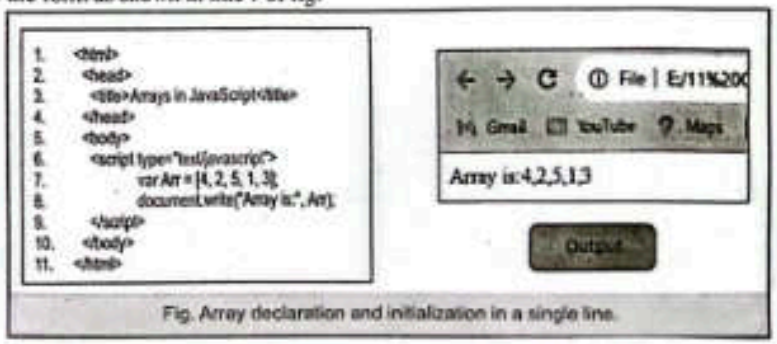


Fig. Array declaration and initialization in a single line.

Alternatively, we can declare a null array first and assign values to it later, as shown below:

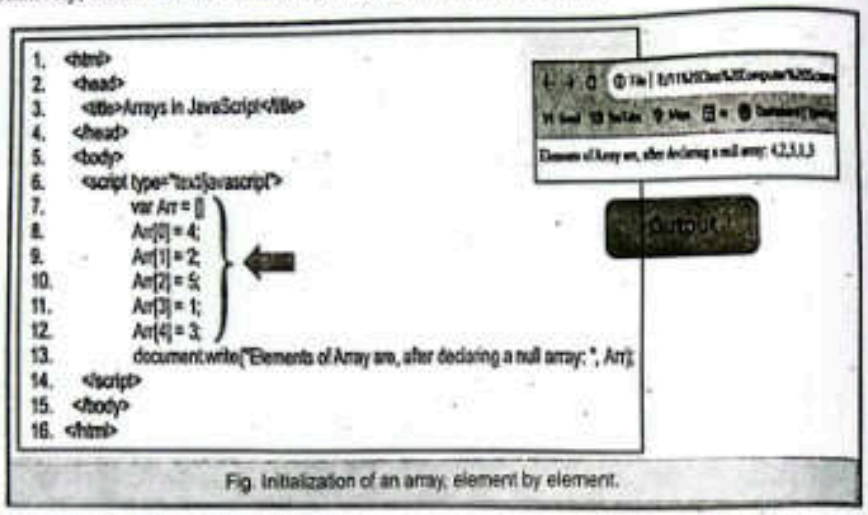


Fig. Initialization of an array, element by element.

So, rather than assigning values one by one as highlighted in the lines 8-12 in above code, we can alternatively use for-loop to populate an array.

Q.12: What are the Functions?

Ans: Functions

Did You Know?
Modularity, Reusability, Abstraction, Encapsulation and Return Values are some characteristics of functions.

Function is a set of line which occurs in the code quite often that can be segmented once, and called again and again. This way, rewriting the same set of code for similar results can be eliminated. Through functions, different sets of code can be separated resulting in fewer lines of code assigning them meaningful names based on their functionality. This leads to efficiently managing a large computer program. Programming languages provide built-in such functions like earlier we have used functions prompts(), input(), etc. Whenever the function is called, the caller does not necessarily need to know the code behind that function, to use it.

A function has a name through which it is identified and called. Additionally, a function can have arguments which are variables local to that function and their life span is limited to the said function. Variables outside functions are global variables and can be accessed anywhere from the program.

Lastly, lets define another function calcBill() which is similar to the above as it accepts 2 arguments, namely bill and 'amount_recvd'. The function subtracts bill from 'amount_recvd'

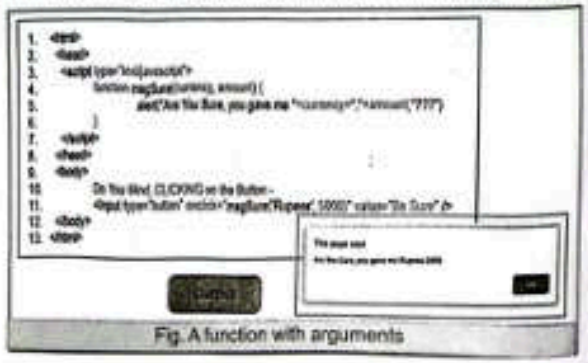


Fig. A function with arguments

and returns the result.

Q.13: How to create a Dynamic Website?

Ans: Create a Dynamic Website

If a school wants to display the result of each student on their website, then they have to create a different static webpage for each student. And as the students increase, so does the handling and managing of these webpages. The solution is to provide dynamic website such that contents change according to the user input. Such dynamic website can be created via JavaScript along with Html and CSS.

Recall iterative statement, where we printed index number via a loop from 0-9. We extended the same code and the revised code is shown in fig. (a), where the initial 9 lines are the same. At line 10, a new function is added namely 'desOrder()' which when is called prints the index in descending order. Additionally, the program has an id of 'dynamic content' and a button which when passed calls the disorder() function. A dynamic content is component / portion of the website that alters based on user input.

```
1.  <html>
2.   <body>
3.    <script type="text/javascript">
4.          var index;
5.          document.write("For-Loop Starts After This ... <br />");
6.          for(index = 0; index < 10; index=index+1){
7.                document.write("Index No. : ", index, "<br />");
8.          }
9.          document.write("For-Loop Stopped!");
10.         function descOrder () {
11.               for(index = 10; index > 0; index=index -1){
12.                     document.write("Index No. : ", index, "<br />");
13.               }
14.         }
15.   </script>
16.   <p id="dynamicContent">Click the button to change output to Descending Order.</p>
17.   <button onclick="descOrder()">Descending Order</button>
18.  </body>
19. </html>
```

Fig. (a): Code to create dynamic websit

As the webpage loads, the index numbers are printed in ascending order and button with a message is visible as shown in fig. (b). On pressing the button, the index numbers are printed in reverse order, as shown in fig.(c).

Moreover, after line 13 in the code, if we add the following line of code:

document. Body. style. background Color = "peach puff";

Save the file, refresh the webpage and press the button, then the output changes to fig-40(d) where the background color of the webpage also changes.

You may try to add another button and separate the functionality of changing the background color.

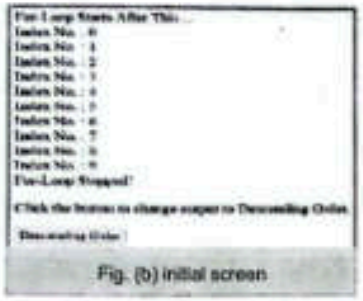


Fig. (b) initial screen

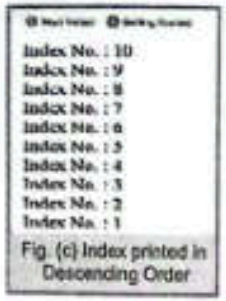


Fig. (c) Index printed in Descending Order

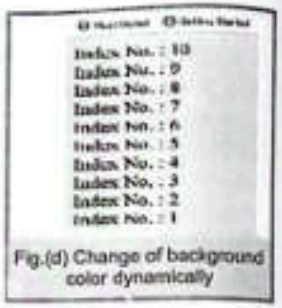


Fig.(d) Change of background color dynamically

Multiple Choice Questions

Select the suitable answer for the following questions.

1. What is the primary function of web applications that makes them exciting for users?
   (a) Display static content
   (b) Providing real time updates
   (c) Creating online newspapers
   (d) Storing images only
2. Which feature of web application allows multiple people to work together simultaneously on a project?
   (a) Customization
   (b) Collaboration
   (c) Security
   (d) Data analysis
3. What can you do with web applications regarding online shopping that adds a personalized touch?
   (a) Watch videos
   (b) Customize items before purchase
   (c) listen to music
   (d) Read articles
4. What is the key advantage of using web applications?
   (a) Offering limited information
   (b) Making learning more interactive
   (c) showing only static images
   (d)Restricting creative expression
5. Which feature of web applications from static websites regarding functionality?
   (a) Watching videos
   (b) Creating Art
   (c) Playing games
   (d) Filling forms
6. What distinguishes web applications from static websites regarding functionality?
   (a) Simplicity in features
   (b) Lack of interactive elements
   (c) Ability to perform complex tasks
   (d) Dependency on outdated browsers
7. Why is user authentication necessary in some web applications?
   (a) To limit website access
   (b) Static content
   (c) to ensure safe interactions
   (d) To display more ads
8. What aspect makes web applications easily accessible on various devices?
   (a) High browser capabilities
   (b) complex integration
   (c) Static content
   (d) Low security measures
9. Which feature allows web applications to offer personalized recommendations?
   (a) Data Analysis
   (b) Static content
   (c) Limited functionalities
   (d) Collaboration tools
10. What attribute of web application makes them suitable for real time updates?
    (a) Lack of user interaction
    (b) Static content display
    (c) Dynamic functionality
    d) Inability to personalize content
11. What is the main purpose of HTML in web development?
    (a) To add interactivity
    (b) Structure and format content
    (c) To style layout
    (d) Create secure connection
12. Which technology is responsible for styling website layout?
    (a) HTML (b) CSS
    (c) Java (d) SQL
13. What is the primary function of java script?
    (a) Structuring content
    (b) Styling the website
    (c) Adding interactivity
    (d) Creating secure connection
14. What distinguishes dynamic website form static?
    (a) Dynamic website use HTML
    (b) Dynamic website have fixed content
    (c) Dynamic website generate and display content in real time
    (d) Static websites are used for social media platforms
15. What is the purpose of HTML <a> element with the href attribute?
    (a) Format Text
    (b) Insert Images
    (c) Create hyperlinks
    (d) Define text style
16. Which of the following is the primary markup language for creating the structure and content of a webpage?
    (a) HTML (b) CSS
    (c) Java (d) SQL
17. CSS is used for?
    (a) Adding interactivity
    b) Structuring web content
    (c) Styling layout and design0
    (d) Defining the logical structure of a webpage
18. Which of the following web technology is used for adding interactivity to a website?
    (a) HTML (b) CSS
    (c) Java (d) SQL
19. What is the key characteristic that sets dynamic websites apart from static websites?
    (a) Dynamic website use more complex programming languages
    (b) Dynamic websites have fixed content
    (c) Dynamic websites generate and display content in real time
    (d) Static Websites respond to user interactions
20. Which keyword is recommended for declaring variables in JavaScript and why?
    (a) var, as it has better compatibility with older browsers
    (b) const, as it allows for variable reassignment
    (c) let, as it is more specific, block scoped, and minimize confusion
    (d) All
21. What does HTML <a> element with the href attribute allow you to do?
    (a) Define text styles
    (b) Insert Images
    (c) Create hyperlinks
    (d) Assign a numeric value
22. Which data type in java represent logical data type?
    (a) String (b) Number
    (c) BigInt (d) Boolean
23. How can java script can be used to modify the content of HTML?
    (a) By changing the attributes
    (b) By creating new DOM tree
    (c) By dynamically changing the content
    (d) By Adding Pseudo classes
24. Which aspect of CSS can javascript be used to modify, allowing for dynamic visual changes in a web application?
    (a) Fonts and typography
    (b) Box model
    (c) Layout and positioning
    (d) All
25. Which keyword is used to declare a constant variable in javascript?
    (a) var (b) let
    (c) const (d) final
26. What is the primary purpose of HTML in web development?
    (a) Styling web pages
    (b) Interacting with databases
    (c) Structuring and formatting
    (d) Handling server side logic
27. Which javascript data type can store numeric values in arbitrary precision

format?
(a) String (b) Number
(c) BigInt (d) Boolean

28. What does DOM stands for?
(a) Document Object Model
(b) Dynamic Object Model
(c) Document Oriented Model
(d) None of these

29. Which aspect of CSS can javascript be used to modify for creating smooth and visually appealing animation?
(a) Transitions and animations
(b) Layout and positioning
(c) Pseudo-classes
(d) Styles and fonts

ANSWERS

1.	b	2.	b	3.	b	4.	b	5.	d	6.	c	7.	c
8.	a	9.	a	10.	c	11.	b	12.	b	13.	c	14.	c
15.	c	16.	a	17.	c	18.	c	19.	c	20.	c	21.	c
22.	d	23.	c	24.	d	25.	c	26.	c	27.	c	28.	a
29.	a												

Short Questions Answers

Q.1: What is World Wide Web (WWW)?
Ans. The World Wide Web, often known as the web, WWW, or W3, is a collection of public websites or pages that people may access via the internet from their local computers and other devices. These pages and papers are linked together via hyperlinks, which users can click on for further information. This information can be in a variety of media, including text, photos, audio, and video.

Q.2: Differentiate between Website and Webpage.
Ans. A webpage is a single web document with a unique URL. Each web page of a given website provides explicit links most of the time in the form of clickable portions of text that allow the user to move from one page of the website to another.

Q.3: Define Web Application.
Ans. A computer program which offers a service or executes tasks via a browser and internet connection, remotely accessing a serving, is called web application. Through web browser, a web application can be visited by users like a Customer Relations Management (CRM) system which handles retailing, supplies, promotions, customers feedback, etc.

Q.4: Differentiate between static website and Dynamic website.
Ans. A **static** website is one that delivers online pages exactly as they were stored, with no real-time content updates. In contrast, a **dynamic** website develops information in real time, generally through the use of databases and scripting languages to enable interaction and personalized experiences.

Q.5: Describe Front-End development and Back-End development.
Ans. Front-End development
A front end of a website provides the interface which is graphical nowadays and termed as Graphical User Interface (GUI) . The person visiting your website views and interacts with GUI.

Back-End development
A person who writes codes about such services that are provided by the website is called a Back-end developer. Back end development requires more knowledge and skill level in hand than front end development, like knowledge of Java Script, Python, PHP, ASP, Net, etc.

Q.6: What is HTML?
Ans. HTML stands for **Hypertext Markup Language**. It is the standard markup language for creating web pages. HTML is a mix of Hypertext and Markup Language. Hypertext defines the link between web sites. A markup language is used to define the text document within a tag, which defines the structure of web pages.

Q.7: What do you know about DOM?
Ans. The **Document Object Model (DOM)** is a standard which provides mutual interpretation where grammar of a language can be associated with and can coexist on various operating systems. In HTML, every file is interpreted as a DOM-tree where hierarchy of the said file is defined.

Q.8: How tags are useful in HTML?
Ans. "Tags" inform web browsers about the web page, such as where to display graphics and how the text is structured.
Tags are always enclosed in angle brackets: <>.
Tags consist of items and attributes. An element is a page object (for example, a headline, paragraph, or image), and attributes are properties that describe the element. Tags typically travel in pairs.

Q.9: How tag is used for line break?
Ans. To split a sentence into multiple lines a
 tag is used. If this tag is not used between 2 sentences, and even you write the second sentence on a new line; html does not recognize this style and will put both the sentences in the same line, one after the other.

Q.10: What are the bullets & Numbering?
Ans. HTML treats bullets and numbering form of an unordered <ul> and ordered list in the <ol>. Bullets can be of type circle, square or disc. The numbered list have the option of numerals and alphabets to choose from, just like a word-editor.

Q.11: What is CSS?
Ans. In the development of HTML webpage the scheme, arrangement and presentation of the whole webpage along with the components are handled by a stylesheet language. There are various stylesheet languages available like **Cascading Style Sheets (CSS)**, Document Style Semantics and Specification Language (DSSSL), Extensible Stylesheet Language (XSL), etc.

Q.12: Differentiate between Internal CSS & External CSS.
Ans. Internal CSS styles are defined in the head section of an HTML document and apply to the entire document, allowing for consistent styling across various elements.
External CSS styles are kept in a separate file and can be linked to numerous HTML documents, allowing for global styling throughout a website.

Q.13: What is Java-Script?
Ans. Java script is an exciting language primarily used in development of web pages and scripts. It does not consume much of memory and that is why it is used at the client-end in developing websites, for making pages dynamic.

Q.14: What is Variable?
Ans. Variables in Java are names for stuff kept in memory. One Java variable can only contain one type of data. Before utilizing a variable in programming, it is essential to declare it. It entails assigning data to a specific memory and naming that memory.

Q.15: What are the operators in Java?
Ans. In Java, operators are symbols that are used to perform certain operations. Operators create seemingly simple tasks like as addition and multiplication, despite the fact that their implementation is quite complex. There are numerous types of operators in Java, which are listed below:
Arithmetic Operators, Unary operators, include assignment and relational Operators.
Logical Operators, Ternary and Bitwise Operators Shift Operators.

Q.16: Describe the use of conditional statement in java.
Ans. Applying an 'if' statement before one or more lines of code on the basis of some

condition is met makes a typical selection scenario. That is, if the condition is met, then those line(s) will be executed otherwise skipped. Some examples of conditional operators are ==, !=, >, <, >=, <=.

Q.17: What is Iterative statement?

Ans. Iterative statement like 'For Loop' is used to get similar kind of task done. Rather than writing the same line of code multiple times, the same task is achieved in much lesser line of code. The 'for loop' works on the basis of an index, which you can initialize in the loop.

Q.18: What are the nested loops?

Ans. A nested loop is an inner loop that exists within the body of another outer loop. The inner or outer loops can be of any type, including while, do while, and for. For example, the inner loop could be a while loop, and the outside loop could be a for loop.

Q.19: What is an Array?

Ans. An array is a datatype which can hold a number of homogenous set of elements. Such that we do not need to define multiple variables of the same type like num1, num2,... num25. Instead, we can declare an array which contains 25 values.

Q.20: What are the elements of an Array?

Ans. Each item in an array is referred to as an element, and it may be accessed by its integer index. As illustrated in the accompanying image, numbering starts with zero. The 9th element, for example, would then be accessed at index 8.

Q.21: What is the primary purpose of HTML?

Ans. The primary purpose of HTML (Hypertext Markup Language) is to structure and format content for display on the internet. HTML is a markup language used to create web pages and serves several key functions.

Q.22: Describe Visual Studio IDE.

Ans. An integrated development environment (IDE) is a helpful tool for creating computer programs. Visual studio is one such tool. It helps you to write, fix, and create software. It has extra features like code helpers, graphic tools, and more to make building programs easier and better.

SOLVED EXERCISE

Multiple Choice Questions

Select the suitable answer for the following questions.

1. Everything in HTML is identified on the basis of _____.
   (a) Brackets (b) Title
   (c) Tags (d) Image
2. The output of HTML code is visible in _____.
   (a) Notepad (b) File
   (c) Browser (d) Spreadsheet
3. Name of a web page can be given using _____ tag.
   (a) Body (b) Title
   (c) Head (d) Footer
4. Main parts of a document are arranged in _____ tag.
   (a) Head (b) Title
   (c) Body (d) Line break
5. The heading tag-pair for 5th level heading is _____.
   (a) <h5 .. h5>
   (b) <h5 ../h5>
   (c) h5> .. < /h5
   (d) <h5> .. </h5>
6. Span is used to provide _____ to a line.
   (a) Font (b) Border
   (c) Style (d) Colour1
7. First row of table in HTML is called _____.
   (a) Title row (b) Top row
   (c) Header row (d) Upper row

8. <P> tag-pair is used for _____.
   (a) Print (b) Page align
   (c) Page break (d) Paragraph
9. A variable cannot start with a _____.
   (a) Alphabet (b) Number
   (c) Character (d) String
10. The first value assigned to a variable after declaration is called _____.
    (a) Beginning value
    (b) Starting value
    (c) Initialization
    (d) Substitution

ANSWERS

1	c	2	c	3	b	4	c	5	d	6	c	7	c
8	d	9	b	10	c								

Short Questions Answers

Q.1: Contrast between website and web application.

Ans: A document which exists and is accessible through internet is a webpage, while a set of webpages is termed as Website. On the other hand, a computer program which offers a service or executes tasks via a browser and internet connection, remotely accessing a serving, is called web application.

Q.2: What is 'href' refers to and how to use it?

Ans: The href property specifies the URL of the linked page. Without the href attribute, the tag does not function as a hyperlink. Tip: To link to the top of the current page, use href="#top" or href="#".

Q.3: Enlist the optional parameters to open a webpage.

Ans: Optional parameters appear at the end of the parameter list, following any necessary parameters. If the caller supplies an argument for any of a series of optional parameters, it must also provide arguments for the preceding optional parameters.

URL parameter concatenation
URL argument for the IDE.
URL parameter for IDE picture.
URL parameter to start duplicate workspaces.

Q.4: List out the frequent tags used in text of a webpage and what are they used for?

Ans: Tags in HTML: HTML Tag, Head Tag, Title Tag, Body Tag, Tag for Headings, Tag for Line Break, Tag the Text

Paragraph Tag

The HTML tags are and whereas the "Paragraph Tag" is the HTML element that contains the on-page text.

Heading Tag

The HTML tags in this example and whereas the HTML element "Heading Tag" represents the on-page heading. Using this element, all text between the beginning.

Bold Tag

The HTML tags **and** are used here, whereas the HTML element "Bold Tag" represents the on-page content.

This tag will make any text between the starting **tag and the ending** tag bold. **Italic Tag** *and* are HTML tags, while "Italic Tag" is an HTML element (on-page text). This tag will make any text between the starting tag and the closing tag italic.

Underline Tag

The HTML tags are represented by and whereas the "Underline Tag" is the HTML element that contains the on-page text.

Q.5: Explain the role of <body> tag-pair in a document.

Ans: The tag specifies the document's body. The element includes an HTML document's contents, including headings, paragraphs, graphics, hyperlinks, tables, and lists. An HTML page can only have one element.

Q.6: How the event based code is used in JavaScript?

Ans: Event-based programming in JavaScript focuses on responding to user interactions or system events such as clicks, keypresses, page loads, and so on. Here's a quick overview of how it's used: **Event Handlers**: JavaScript lets you connect event handlers to HTML elements. Typically, this is accomplished by the use of characteristics such as onclick, onmouseover, and onkeydown.

Q.7: Infer about the External CSS? Where are External CSS generally used?

Ans: External CSS is CSS (Cascading Style Sheets) that are stored in external files and linked to HTML texts. These files usually have a.css extension. External CSS is a fundamental notion in web development that is commonly used to style web pages.

Long Questions (Exercise)

Q.1: What is Document Object Model? Explain with the of an example.

Ans: The Document Object Model (DOM) is a standard which provides mutual interpretation where grammar of a language can be associated with and can coexist on various operating systems.

. In HTML, every file is interpreted as a DOM-tree where hierarchy of the said file is defined. As discussed in last chapter, a tree consists of nodes and links, so is the case here where every object and component of HTML is treated as node. Hence, the file, components, features, script and even comments which exist in a web page all are treated as objects by HTML as shown in fig.

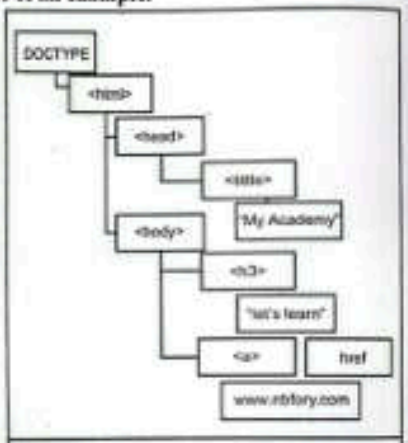


Fig. General DOM Tree

Simpler approach in locating any object in a web page via accessing the DOM-tree is 'element-id'. So, we will call function like 'getElementByld()' and it will either return the object of the element we seek if it is able to locate it else a null value is returned.

Lets take a look at this simple example.

```
<!DOCTYPE html>
<html lang="en " dir="ltr">
<head>
  <title> this text displays the title of the web page </title>
</head>
<body>
<h1> HELLO WORLD </h1>
<p> the above text will be larger in size </p>
</body>
</html>
```

Q.2: Write code to differentiate between different types of headings in HTML.

Ans:

To distinguish between different types of headings in HTML, use CSS to apply distinct styles to each heading level (h1, h2, h3, etc.). Here's an example.

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>Heading Differentiation</title>
  <style>
    h1 {
      color: blue;
    }
    h2 {
      color: green;
    }
    h3 {
      color: red;
    }
    /* Add styles for other heading levels as needed */
  </style>
</head>
<body>
  <h1>This is a level 1 heading</h1>
  <h2>This is a level 2 heading</h2>
  <h3>This is a level 3 heading</h3>
  <!-- Add more headings as needed -->
</body>
</html>
```

In this example:

CSS specifies a different color for each heading level (h1, h2, and h3).

The h1 elements are styled in blue, the h2 in green, and the h3 in red.

You can add styles for extra heading levels (h4, h5, etc.) by adding CSS rules to the selectors.

Each heading level indicates a distinct level of importance or hierarchy within the document structure, and the visual design reflects that hierarchy.

Q.3: Elaborate steps and provide code to load a background image in a webpage.

You can use CSS to load a background image on a webpage. Here are the steps to accomplish this:

Choose an image. First, decide which image you wish to use as the background. Ensure that the image is correctly scaled and optimized for web consumption.

Place the image in your project. Save the selected image to a directory within your project folder.

Create an HTML structure for your webpage. This normally consists of an HTML document having and parts.

Link to your CSS file: Include a link to your CSS file in the section of your HTML document to style the background images.

CSS Styling: In your CSS file, specify the styling for the background image. You will specify that Background image URL and any extra attributes such as background size, location, and repeat.

Apply Background Image Styling: Use CSS selectors to target the appropriate HTML element(s) and apply background image styling.

Here's a sample code that illustrates these steps:

HTML (index.html):

```
<!DOCTYPE html>
```

```
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>Background Image Example</title>
  <link rel="stylesheet" href="styles.css">
</head>
<body>
  <div class="container">
    <h1>Welcome to My Website</h1>
    <p>This is a sample webpage with a background image.</p>
  </div>
</body>
</html>
```

Q.4: With the help of sample code, highlight different methods to incorporate CSS code in a HTML webpage.

Ans: Certainly! There are several ways to incorporate CSS code into an HTML webpage. Here's a sample HTML file with examples of different methods:

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>CSS Incorporation Methods</title>
  <!-- Method 1: Inline CSS -->
  <style>
    p {
      color: blue;
    }
  </style>
  <!-- Method 2: External CSS file -->
  <link rel="stylesheet" type="text/css" href="styles.css">
  <!-- Method 3: Internal CSS using <style> within the <head> -->
  <style>
    h1 {
      color: green;
    }
  </style>
</head>
<body>
  <!-- Method 4: Inline style attribute -->
  <h1 style="color: red;">Heading with inline style</h1>
  <p>This paragraph has inline CSS applied.</p>
  <!-- Method 5: Import CSS using @import -->
  <style>
    @import url('imported-styles.css');
  </style>
```



```
  <!-- Method 6: Using the <link> tag with a media attribute -->
  <link rel="stylesheet" type="text/css" href="print-styles.css" media="print">
  <p>Some text content.</p>
</body>
</html>
```

In this example:

1. **Inline CSS (Method 1):** CSS styles are defined directly within a '<style>' tag in the '<head>' section of the HTML document. This method is useful for small, specific styles.
2. **External CSS file (Method 2):** CSS styles are stored in an external file ('styles.css') and linked to the HTML document using the '<link>' tag. This method allows for better organization and reuse of styles across multiple pages.
3. **Internal CSS using '<style>' within the '<head>' (Method 3):** Similar to inline CSS, but the styles are defined within another '<style>' tag in the '<head>' section. This method is useful when you want to separate different sets of styles within the same document.
4. **Inline style attribute (Method 4):** CSS styles are applied directly to individual HTML elements using the 'style' attribute. This method is useful for applying specific styles to individual elements.
5. **Import CSS using '@import' (Method 5):** CSS styles are imported from an external file ('imported-styles.css') using the '@import' rule within a '<style>' tag. This method allows for modularization of styles.
6. **Using the '<link>' tag with a media attribute (Method 6):** CSS styles are linked to the HTML document using the '<link>' tag with a 'media' attribute set to 'print'. This method allows for specifying different stylesheets for different media types, such as screen or print.

These methods offer flexibility in how CSS styles can be incorporated into HTML documents, depending on factors such as the scope of styles, reusability, and organization.

Q.5: Sketch steps and provide code to apply border and color to a table in a webpage.

Ans: By using CSS, you can provide borders in table as well. For this purpose, we initially need to state the 'style' tag-pair just before the start of table and later inside the block, we need to set which style to opt for and where to apply it. As shown in the following code, as shown in fig 14. We are defining border for table, table header cells every other cell in the table. Other than that, we can also designate a background colour for the table.

```
1. <style"
2. table, th, td {
3.       border: 1px solid black;
4.   }
5. </style>
```

Student Name	Class	Free Dues
Alia	9	200
Zia	9	0
Ghufran	9	500
Naveed	9	0
Haris	9	300

Fig. Applying Borders to Table

We may add background colour of the table as well, by adding the following code, as shown in fig. in 'style' tag-pair.

```
1. <style>
2. th, td {
3.       background-color: aqua;
4.   }
5. </style>
```

Student Name	Class	Fee Dues
Ala	9	200
Zia	9	0
Shahan	9	500
Naveed	9	0
Haris	9	300

Fig: Provide table with a background color

Q.6: Discuss the functionality JavaScript can provide in a webpage with the help of a suitable example code.

Ans: JavaScript offers a variety of features that can improve a webpage's interaction, dynamic behavior, and functionality. Here's an example code displaying some of the common functionalities that JavaScript can give on a webpage:

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>JavaScript Webpage Functionality</title>
  <style>
    .container {
      text-align: center;
      padding: 20px;
    }
  </style>
</head>
```

JavaScript provides the following functionality:

Dynamic Content:

JavaScript may dynamically change the content of a webpage. In this example, hitting the button invokes a function (changeColor()) that modifies the color of the text.

Event Handling: JavaScript may respond to user events like as clicks, keypresses, and mouse movements. In this case, the onclick event of the button calls the changeColor() function.

DOM Manipulation: JavaScript may use the Document Object Model (DOM) to dynamically edit HTML elements, properties, and styles. The changeColor() function selects the paragraph element using document.getElementById() and changes its text color.

Q.7: Articulate steps and write code to create a scrolling text on a webpage.

Ans:

Creating scrolling text on a webpage can be achieved using CSS and JavaScript. Here are the steps along with example code to create scrolling text:

Steps:

1. **Create HTML Structure**: Define an HTML element to contain the scrolling text.
2. **Apply CSS Styling**: Use CSS to style the container element and set overflow properties to enable scrolling.

3. **Write JavaScript**: Use JavaScript to animate the scrolling effect.

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>Scrolling Text Example</title>
  <style>
    /* Container styles */
    .scroll-container {
      width: 300px;
      height: 100px;
      overflow: hidden; /* Hide overflow content */
      border: 1px solid #ccc;
      padding: 10px;
      margin: 0 auto;
    }
    /* Inner content styles */
    .scroll-content {
      white-space: nowrap; /* Prevent text wrapping */
      animation: scrollText 10s linear infinite; /* Apply scrolling animation */
    }

    /* Keyframes for scrolling animation */
    @keyframes scrollText {
      0% { transform: translateX(100%); } /* Start position */
      100% { transform: translateX(-100%); } /* End position */
    }
  </style>
</head>
<body>

  <div class="scroll-container">
    <div class="scroll-content">
      Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed sit amet justo ut dui viverra congue.
    </div>
  </div>
</body>
</html>
```

Q.8: Enlist steps to add a video clip in a website which starts playing as the web page loads.

Ans: To add a video clip to a website that starts playing as soon as the page loaded, follow these steps:

Prepare your video clip. Make sure you have the video clip you wish to use in the appropriate format (e.g., MP4, WebM). Also, make sure that the video clip is optimized for web delivery to save load times.

Place the video file in your project directory. Save the video to a directory within your project

folder.

Insert the video element into your HTML: To embed a video clip on your webpage, use the HTML element.

Configure the video element's attributes: Control the video's playback behavior by setting attributes like autoplay, muted, and loop.

Style Your Video Elements (Optional): Use CSS styles to use the element to customize its appearance and layout on the webpage. **Test your webpage:** Open your webpage in a web browser to confirm that the video begins playing automatically as the page loaded.

```
1.  <!DOCTYPE html>
2.  <html>
3.  <body style = "text-align: center">
4.    <h2style="color: green">Pakistan's First Ever Win in International
5.      Football</h2>
6.    <p>Congratulations !!!</p>
7.    <video width = "500px" height = "500px" controls>
8.      <source src = "fifa-win.mp4" type = "video/mp4"/>
9.    </video>
10. </body>
11. </html>
```

Fig. (a): Sample code to load a video clip in a website

Q.9: Cite steps on compiling the result of your last examination in a tabular form and display it in a webpage.

Ans: Sure, here's how to compile the findings of an examination in a tabular format and present them on a webpage:

Gather Data: Collect the exam results, including student names, IDs, and scores.

Organize Data: Put the information into a structured format, such as a spreadsheet. Columns could include the student's name, ID, and score.

Create an HTML file to display the table data. You can use a text editor like Notepad or an integrated development environment (IDE) such as Visual Studio Code.

Add Table Structure: To construct a table structure in an HTML file, use the element. Use for rows and for cells.

Insert Data: Fill in the table cells with the examination results data. Use JavaScript, server-side programming languages such as PHP, or manually enter the data if it is static.

Styling: To make the table visually appealing, use CSS to style it using fonts, colors, borders, and other elements.

Save the HTML file. Save the HTML file under a suitable name, such as exam_results.html.

Preview: Use a web browser to examine the HTML file and confirm that the table displays correctly.

Here is a basic example of what the HTML code could look like:

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
```



```
  <title>Exam Results</title>
  <style>
    table {
      width: 100%;
      border-collapse: collapse;
    }
    th, td {
      border: 1px solid #dddddd;
      text-align: left;
      padding: 8px;
    }
    th {
      background-color: #f2f2f2;
    }
  </style>
</head>
<body>
<h2>Exam Results</h2>
<table>
 <tr>
  <th>Student Name</th>
  <th>Student ID</th>
  <th>Score</th>
 </tr>
 <tr>
  <td>John Doe</td>
  <td>12345</td>
  <td>85%</td>
 </tr>
 <!-- More rows can be added for additional students -->
</table>
</body>
</html>
```

Q.10: In context of Fig. (d), add another button namely 'Revert' which when is pressed, it will reverse both the color and index values.

Ans:

Sample Code

```
 <!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>Exam Results</title>
  <style>
    table {
      width: 100%;
```

```
            border-collapse: collapse;
        }
        th, td {
            border: 1px solid #dddddd;
            text-align: left;
            padding: 8px;
        }
        th {
            background-color: #f2f2f2;
        }
        .button {
            background-color: #4CAF50;
            border: none;
            color: white;
            padding: 10px 20px;
            text-align: center;
            text-decoration: none;
            display: inline-block;
            font-size: 16px;
            margin: 4px 2px;
            cursor: pointer;
        }
    </style>
</head>
<body>
<h2>Exam Results</h2>

<table id="resultsTable">
  <tr>
    <th>Student Name</th>
    <th>Student ID</th>
    <th>Score</th>
  </tr>
  <tr>
    <td>John Doe</td>
    <td>12345</td>
    <td>85%</td>
  </tr>
  <!-- More rows can be added for additional students -->
</table>
<button class="button" onclick="reverseValues()">Revert</button>
<script>
    function reverseValues() {
        var table = document.getElementById("resultsTable");
        var rows = table.getElementsByTagName("tr");
    for (var i = 1; i < rows.length; i++) {
        var cells = rows[i].getElementsByTagName("td");
```



```
        for (var j = 0; j < cells.length; j++) {
            var cell = cells[j];
            var currentValue = cell.innerHTML;
            if (j == 0) {
                cell.innerHTML = currentValue.split("").reverse().join("");
            } else if (j == 1) {
                cell.innerHTML = currentValue.split("").reverse().join("");
            } else if (j == 2) {
                var scoreValue = parseInt(currentValue);
                if (!isNaN(scoreValue)) {
                    var reversedScore = 100 - scoreValue;
                    cell.innerHTML = reversedScore + "%";
                }
            }
        }
    }
</script>

</body>
</html>
```

Solved Activities & Projects

Activity-1:
Create a time table for the subjects mentioned in the fig. and display on a new page by providing a time table link on the main page.
Ans. Sure, here's a simple example of a timetable for the subjects English, Maths, Urdu, and Computer:

Time	Monday	Tuesday	Wednesday	Thursday	Friday
9:00-10:00	English	Maths	Urdu	Maths	Computer
10:00-11:00	Maths	English	Maths	Urdu	English
11:00-12:00	Urdu	Maths	English	Computer	Maths
12:00-1:00	Computer	Urdu	Computer	English	Urdu

You can put this timetable on a new page and provide a link to it on the main page. Here's an example of how you might create the link:
a href="timetable.html">View Timetable
Just replace "timetable.html" with the actual file name and path where you've created the timetable. This link can be placed on your main page wherever you want it to appear.

Activity-2:
Using '\' and '/' draw a big 'X' .
Ans. To create a 'X' using just the characters '' and '/', you can use HTML and CSS to position them in the shape of a 'X'. Here's how you can do it:

```
<!DOCTYPE html>
<html lang="en">
```

```
<head>
<meta charset="UTF-8">
<meta name="viewport" content="width=device-width, initial-scale=1.0">
<title>X</title>
<style>
  .container {
    display: flex;
    justify-content: center;
    align-items: center;
    height: 100vh;
  }
  .line {
    position: relative;
    width: 150px;
    height: 2px;
    background-color: black;
    transform-origin: center;
  }
  .line::before,
  .line::after {
    content: '';
    position: absolute;
    top: 0;
    left: 0;
    width: inherit;
    height: inherit;
    background-color: inherit;
  }
  .line::before {
    transform: rotate(45deg);
  }
  .line::after {
    transform: rotate(-45deg);
  }
</style>
</head>
<body>
<div class="container">
  <div class="line"></div>
</div>
</body>
</html>
```

Project-1:

Design a webpage for annual function of your school.

Provide with:

- Schedule of events
- List of invited guest speakers

- Major awards that will be distributed by chief guest.

Add some relevant text paragraphs and photographs for each point, along with an introductory paragraph.

Ans.

```
<!DOCTYPE html>
<html lang="en">
<head>
 <meta charset="UTF-8">
 <meta name="viewport" content="width=device-width, initial-scale=1.0">
 <title>Annual Function</title>
 <style>
  body {
   font-family: Arial, sans-serif;
   margin: 0;
   padding: 0;
  }
  header {
   background-color: #333;
   color: #fff;
   padding: 20px;
   text-align: center;
  }
  section {
   padding: 20px;
  }
  h2 {
   color: #333;
  }
  p {
   color: #666;
  }
  .event-schedule {
   margin-bottom: 20px;
  }
  .guest-speakers {
   margin-bottom: 20px;
  }
  .awards {
   margin-bottom: 20px;
  }
  footer {
  background-color: #333;
  color: #fff;
  padding: 10px;
  text-align: center;
  position: fixed;
  bottom: 0;
  width: 100%;
 }
```

```
  </style>
</head>
<body>
  <header>
    <h1>Annual Function 2024</h1>
    <p>Join us for a memorable evening filled with joy, performances, and recognition.</p>
  </header>
  <section class="event-schedule">
    <h2>Schedule of Events</h2>
    <p>Our annual function will feature various performances and activities. Here's the schedule:</p>
    <ul>
      <li>Opening Ceremony</li>
      <li>Cultural Performances</li>
      <li>Award Distribution</li>
      <li>Guest Speeches</li>
      <li>Closing Ceremony</li>
    </ul>
  </section>
  <section class="guest-speakers">
    <h2>Invited Guest Speakers</h2>
    <p>We are honored to have esteemed guest speakers joining us for the event:</p>
    <ul>
      <li>Pro. Faisal Zia: Renowned Author and Educator</li>
      <li>Ms. Sarah Johnson - Humanitarian and Activist</li>
    </ul>
  </section>
  <section class="awards">
    <h2>Major Awards</h2>
    <p>The following major awards will be distributed by our chief guest:</p>
    <ul>
      <li>Best Student of the Year</li>
      <li>Excellence in Academics</li>
      <li>Outstanding Contribution to Sports</li>
      <li>Leadership Award</li>
    </ul>
  </section>
  <footer>
    <p>&copy; 2024 UGI. All rights reserved.</p>
  </footer>
</body>
</html>
```

Project-2

Create a webpage about you and your hobbies (like stamp collecting , pets, etc.). the webpage initially should highlight about your family background, your personal achievements and activities. Later, provide details about your every hobby for creating awareness and motivation for others. You may add some related links for others who want to start and opt for the same hobbies.

Ans. Certainly! Here's a simple homepage design that focuses on my family history, personal achievements, and hobbies:


```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>About Me and My Hobbies</title>
  <style>
    body {
      font-family: Arial, sans-serif;
      margin: 0;
      padding: 0;
    }
    header {
      background-color: #333;
      color: #fff;
      padding: 20px;
      text-align: center;
    }
    section {
      padding: 20px;
    }
    h2 {
      color: #333;
    }
    p {
      color: #666;
    }
    ul {
      list-style-type: none;
      padding: 0;
    }
    li {
      margin-bottom: 10px;
    }
    footer {
      background-color: #333;
      color: #fff;
      padding: 10px;
        text-align: center;
        position: fixed;
        bottom: 0;
        width: 100%;
      }
    </style>
  </head>
  <body>
    <header>
      <h1>About Me and My Hobbies</h1>
```

```
</header>
<section id="family-background">
 <h2>Family Background</h2>
 <p>I come from a loving family with diverse interests and talents. My parents have always been supportive of my endeavors, encouraging me to pursue my passions.</p>
</section>
<section id="personal-achievements">
 <h2>Personal Achievements</h2>
 <p>Throughout my life, I've had the privilege of achieving several milestones. Some of my notable accomplishments include academic awards, volunteer work, and participation in extracurricular activities.</p>
</section>
<section id="hobbies">
 <h2>My Hobbies</h2>
 <ul>
  <li>
   <h3>Stamp Collecting</h3>
   <p>Stamp collecting has been a cherished hobby of mine since childhood. It allows me to explore different cultures, historical events, and artistic expressions through postage stamps. If you're interested in starting your own collection, check out <a href="https://www.stampworld.com/">StampWorld</a> for resources and tips.</p>
  </li>
  <li>
   <h3>Pets</h3>
   <p>I'm an avid animal lover and enjoy spending time with my pets. Whether it's walking my dog in the park or cuddling with my cat at home, having pets brings immense joy and companionship to my life. If you're considering adopting a pet, visit your local animal shelter or check out <a href="https://www.petfinder.com/">Petfinder</a> to find your perfect match.</p>
  </li>
  <!-- Add more hobbies as needed -->
 </ul>
</section>
<footer>
 <p>&copy; 2024 My Website. All rights reserved.</p>
</footer>
</body>
</html>
```

Project-3:

Home made food items are getting popularity, but majority are lacking a website to market their products and new innovations. Your target is to come up with a colorful webpage emphasizing the awareness of organic and home-based meals.

Moreover, you need to put in a menu of food items with prices and number of persons servings.

The major ingredient need to be listed against each item of the menu with a picture. Design a corresponding logo for the website, too. And use the same logo as a background for the website. Lastly, provide contact details and delivery options.

Ans. Lab Work/ Practical

UNIT 04

DATA AND ANALYSIS

Long Questions

Q.1 Explain Data and Analysis in details.

Ans. Data and Analysis

Data: Data is a collection of information or facts that we gather about something. It can be represented by numbers, measurements, descriptions, sounds or pictures. Here are two example of data. In a science experiment when you record the temperatures at different times, that temperature values are data. If you conduct a survey of your classmates and get to know how many of them like Mathematics, it will be called data.

Data Analytics: Data analysis refers to the process of carefully examining and studying data to identify patterns, draw conclusions, or make the data meaningful. It's like solving puzzle or retrieving meaningful results from the given or collected data. To analyze data, you can use mathematical calculations, statistical techniques, charts, or other tools to understand data. For example, after recording hourly temperature data in a science experiment you can create a graph to see how it changed over time. From graphical representation of data, you draw a conclusion that it got warmer as the day went on, that information we collect and data analytics is the way we observe it to get meaningful information. Data analytics can be quantitative (numeric) and qualitative.

Q.2 Explain the fundamentals of data science and its associated concepts.

Ans. Data science refers to an interdisciplinary field of multiple disciplines that uses mathematics, statistics, data analysis, and machine learning to analyze data and to extract knowledge and insights from it. It is like a pipeline from data to insights.

Concepts of Data Science

Data science consists of many components, theories and algorithms. To understand data science and make its productive usage, following are some key concepts or components that lay the foundation of data science;

Did You Know?

Numeric, Text, Boolean, Date & Time, Collections, Binary and Geographical are some examples of data.

Data

Data is a collection of observations, facts or information collected from different sources. This data can be in the form of numbers, measurements, words, observations, or in audio or video form.

Dataset

Data set is a structured or processed collection of data usually associated with a unique body of work.

Statistics and Probability

Statistics is the analysis of the frequency of past events and probability is to predict the likelihood of future events. Data scientists use statistics and probability to find patterns and trends in the data.

Mathematics

Mathematics is a fundamental part of data science which helps to solve problems, optimize the model performances, and interpret huge complex data into simple and clear results, for decision making.

Machine learning

Machine learning is a branch of Artificial Intelligence and computer science which emphasis on the use of data and algorithms to imitate human learning by the computers.

Deep learning

Deep learning is the subset of Machine learning, with emphasis on the use of data and algorithms to imitate human learning by the computers.

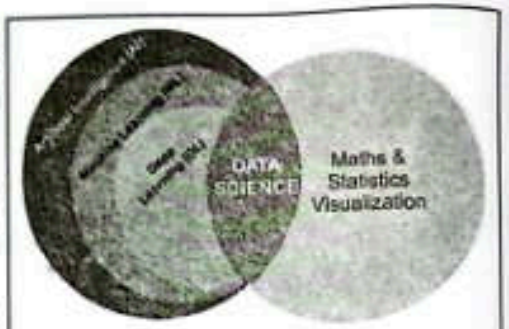


Fig. 4.1: The relationship of some of the key concept is shown in

Data mining:

Data mining is the subset of data science which primarily focuses on discovering patterns and relationships in existing datasets. The usage of technique and tools is limited in data mining as compared to data science.

Data Visualization:

Data visualization is the graphical representation of data using common charts, plots, infographics, and animations. These visual displays of information communicate complex data relationships and data-driven insights in a way that is easy to understand.

Big Data:

Big data refers to handling large volumes of data. Data scientists use big data to find patterns and trends in datasets, to obtain more accurate and reliable results. The huge size of data provides more opportunities for machine learning and provides better results.

Predictive Analysis:

Predictive analysis is the use of data to predict future trends and events based on historical data.

Natural Language Processing (NLP):

It is the study of interaction between human language and computers. The common uses of NLP are chatbots, language translators and sentiments analysis.

Q.3 Explore the scope and applications of data science in various domains.

Ans. Data science is used for a wide range of applications which includes predictive analytics, machine learning, data visualization, recommendation systems, sentiment analysis, fraud detection, and decision-making in various industries like healthcare, finance, marketing and technology. A business problem is a gap between the existing and desired state of a situation. It is a desired action or series of actions to achieve an objective. Various business problems can be solved through data science, some of them are as follows;

- To decide the best routes for shipping of goods or passenger airplanes.
- To choose the best product among many, which one to buy A or B.
- To foresee delays for flight / ship / train etc. (through predictive analysis).
- To create promotional offers (which products are more popular than others)
- To find the best suitable time to deliver goods to reduce cost.

- To analyze health benefit of physical training programs.
- To predict some fore coming event like who will win elections.

Q.4 Analyze the relationship between business challenges and the role of data science in addressing them.

Ans. Data science can be applied to various businesses after analyzing the available data, some of them are:

Industry

Data science can be used to make data driven decisions by analyzing historical data and predicting future trends. It can also help in effective marketing and improving quality control.

Consumer Goods

Data science skills can be used to optimize inventory according to the demand forecasting of particular goods in particular social groups, communities and demographics.

Logistic Companies

These companies can apply data science for their rout optimization, demand forecasting, real-time tracking, load balancing, carrier selection, cost reduction and global trade optimization.

Stock Markets

Data science techniques and tools can be helpful in algorithmic trading, market sentiment analysis, volatility predictions, quantitative analysis, machine learning based trading, market surveillance and risk management etc.

E-commerce

In e-commerce data science helps in recommendation systems, customer segmentation, shopping cart analysis, fraud detection, supply chain optimization and customers sentiment analysis etc.

Q.5 Identify and classify the various types of data used in the field of science.

Ans. Data types in Data Science

In data science we can mainly classify data into two main types qualitative (categorical) and quantitative (numeric).

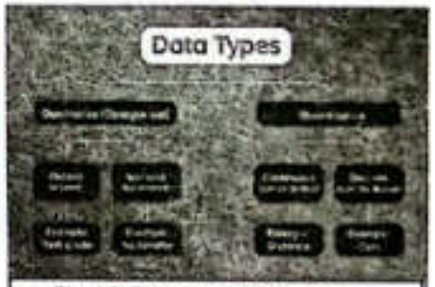


Fig. 4.2: Data types in Data Science

Qualitative or Categorical data describes an object or a group of objects that can be labeled according to some group category. It cannot be represented in numerical from. For example, data including colors, places, etc. it is further subdivided into two types.

i) **Ordinal data**

ii) **Nominal data**

Ordinal data

Ordinal data sees a specific order or ranking, it uses certain scale or measure to group data into categories. Such as in test grades, economic status, or military rank.

Nominal Data:

Nominal data does not have any order, it can be labeled into mutually exclusive categories, which cannot be ordered meaningfully. For example, if we consider the categories of transportation as car, bus or train. Similarity, gender, city, color, employment status are also examples of nominal data.

Quantitative or Numerical data deals with numeric values, that can be computed mathematically to draw some conclusions. Examples of numeric data are height, weight, number of students in a school, fruits in a basket etc. Quantitative data can be further divided into two types;

i) **Discrete data**

ii) **Continuous data**

Discrete Data

It includes data which can only take certain values and cannot be further subdivided into smaller units. This data can be counted and has a finite number of values. For example, the number of product reviews, ticket sold, computers in certain departments, employees in a company etc.

Continuous Data

It refers to the unspecified number of possible measurements between two realistic points or numbers. For example: Daily wind speed, weight of newborn babies, freezer's temperature etc.

Q.6 Describe data set and database in details.

Ans. A **dataset** is a structured or organized collection of data, which is usually associated with a unique body of work. However, a **database** is an organized collection of data stored in multiple datasets or tables. These tables can be accessed electronically from the computer system for further manipulation and update.

To perform actions on the data stored in a database, we need a Database Management System (DBMS). DBMS is the interface between the database and the end user, providing a platform to create, modify, and retrieve data. There are many different Database Management Systems available, depending on the type of data base being used.

For example, relational databases, which store data in tables, can be managed by database management systems such as MySQL, Oracle, MS-Access and IBM Db2. These are the most used databases in Data Science, for the data which is presented in a tabular format.

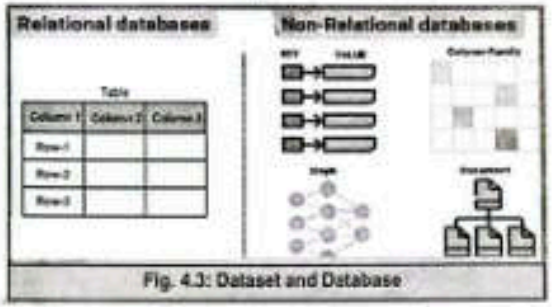


Fig. 4.3: Dataset and Database

Role of Database in data science

Before the advent of database systems, computer scientists relied on file management systems to store and manage data. However, without a structured method of storing data, it would be of little use. This is why databases were introduced to manage and store large amounts of data. The first database management system was developed in 1960s.

There are two key reasons why databases have become so popular in recent years:

- The rapid increase in data generation
- The dependence of data science on data

Case study for use case of data base and Data Science

In the old days, people used to buy their necessities from various shops. For example, if you had to buy a calculator, a box of yogurt, shoe polish and a pair of socks of school uniform, you were supposed to visit four various shops. Such shopping was never an enjoyable experience because shops often had less space for customers and they had to wait for the shopkeeper to find their desired item.

The introduction of supermarkets, however, changed that, as they made shopping much more pleasant by displaying all the products in a large space and making them easily accessible to customers.

Month	Food Items	Clothing and Footwear
Jan-23	11.85	8.95
Feb-23	11.75	9.54
Mar-23	16.53	10.52
Apr-23	15.01	20.25
May-23	10.75	9.52
Jun-23	16.11	18.75
Jul-23	11.56	7.66
Aug-23	10.52	8.71
Sep-23	11.25	8.15
Oct-23	12.75	9.57
Nov-23	11.23	8.41
Dec-23	11.89	10.63

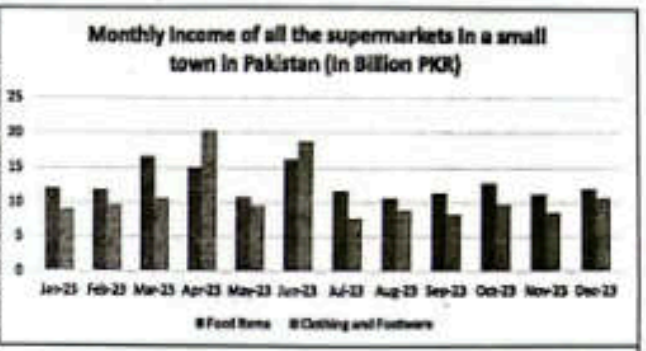


Fig. 4.4: Monthly income of all the supermarkets in a small town in Pakistan

Q.7 Discuss the process of collecting data within the framework of data science.

Ans. Data Collection is the process of collecting information from relevant sources to find a solution to the given statistical enquiry. Collection of Data is the first and foremost step in a statistical investigation. Data collection methods are divided into two categories:

i) **Primary data collection**

ii) **Secondary data collection**

Primary Data Collection Methods

It involves the collection of original data directly from the data source or via direct interaction with the respondent. A respondent is a person from whom the statistical information required for the enquiry is collected. Some common primary data collection methods are as follows:

i) Surveys and Questionnaires
ii) Interviews
iii) Observations
iv) Experiments
v) Focus groups
vi) Sensors
vii) IoT devices
viii) Biometric devices

Secondary data collection Methods

It involves data collection using existing data collected by someone else for some purpose. Such data is usually available in the form of published material like research paper, books, websites etc. Some common secondary data collection methods are as follows:

i) Published sources
ii) Online databases
iii) Government and institutional records
iv) Surveys and Questionnaires conducted in the past
v) Social media data / posts
vi) Publicly available data
vii) Past research studies

Q.8 Provide a comprehensive analysis of the following terms:

- Data Storage
- Data visualization
- Summary Statistics
- Requirement of Summary Statistics

Ans. Data Storage

After data collection, effective storage of data is an essential step for managing and analyzing the large volumes of data. There are various data storage methods according to the nature of data. Some common data storage methods are as follows:

i) Relational / NoSQL databases
ii) Data warehouse
iii) Distributed file systems
iv) Cloud based data storage
v) Blockchain

Data Visualization

Data visualization is graphical representation of data to get meaningful insight, trends, and patterns from data. The visual elements which help in data visualization are charts, graphs, maps, figures and dashboard etc.

Summary Statistics

It is information about the data in a sample. It can help understand the values better. It may include the total number of values, minimum value, and maximum value, along with the mean value and the standard deviation corresponding to a data collection. Summary statistics help to understand the trends, outliers, and distribution of values in a data set.

Requirements of Summary Statistics

The summary statistics provide a quick overview of characteristics of data. It leads towards a better understanding of data cleaning, data preprocessing, feature selection and data visualization.

Fig. 3vs

Q.9 Explain Big Data: Also write a comprehensive note on three Vs.

Ans. Big data contains greater variety, arriving in increasing volumes and with more velocity. This is also known as the three Vs. Big data is larger, more complex datasets, especially from new data sources. These data sets are so voluminous that traditional data processing software cannot manage them. These massive volumes of data can be used to address business problems which were difficult to handle before.

The three Vs of big data are:

Volume

It refers to the amount of data. Big data deals with huge volumes of low-density, unstructured data. The size / volume of data may vary from system to system. For some organizations, this might be tens of terabytes of data. For others, it may be hundreds of petabytes.

Velocity

It refers to the speed of data velocity is the fast rate at which data is received. Normally, the highest velocity of data streams directly into memory rather than being written to disk. Some internet-enabled smart products operate in the real-time and will require real-time evaluation and action.

Variety

It refers to the various formats and types of data that are available. Traditional data types were

structured and fit neatly in a relational database. With the rise of big data, data comes in new data types. These unstructured data (text, images, videos) and semi structured data (JSON, XML) types require additional preprocessing to derive meaningful insight.

Q.10 Trace the evolution of big data through its historical timeline. Also explains its advantages:

Ans. The term big data emerged in the early 2000s as a term to describe exponential growth of data. Around 2005, people began to realize just how much data users generated through data. Around 2005, people began to realize just how much data users generated through face-book, YouTube, and other online services. In 2005 a tool called Hadoop (an open source framework created specially to store and analyze big datasets) was developed, which helped store and manage huge data.

Advantages and benefits of big data:

Big data contains more information therefore it helps individuals, organizations, and business to optimize and generate cost effective solutions. Big data has many advantages for the betterment and progress of business, some of them are as follows:

Product Development

Developing and creating new products, services or brands is much easier when based old data collected from customers needs and wants. Companies use big data to anticipate customer demand. They build predictive models for new products and services by classifying key attributes of past and current products.

Predictive Maintenance

It is a maintenance strategy that uses the analysis of existing data to predict when equipment, machinery or product is likely to fail. Therefore, it indicates the potential issues before the problems happen.

Customer Experience / Satisfaction

A clearer view of customer experience is more possible now than ever before. Big data enables the business together data from social media, web visits, call logs, and other sources to improve customer satisfaction.

Fraud and Compliance

Big data analytics can identify and detect unusual suspicious patterns and anomalies. As a result provides an effective tool to detect fraudulent activities and enhance cyber security measures.

Did You Know?

E-Commerce, Healthcare, Finance, Supply Chain, Telecommunication and Logistics are Applications of Big Data.

Big data Challenge

Since there are many advantages of big data, businesses encounter many challenges of big data. Some of them are as follows:

i) **Data Quality:** Poor quality of data may lead to errors, inefficiency and misleading insight after data analysis.
ii) **Data Security and Privacy:** It is difficult to manage the protection and privacy of massive datasets to prevent unauthorized access.
iii) **Rapid growth of Data:** Making systems that can handle more and more data as it keeps on growing without slowing down is challenging.
iv) **Big Data Tool Selection:** Ensuring compatibility and seamless interaction between different big data tools and platforms.
v) **Data integration:** To create harmony among diverse data formats and structures is a difficult task.

Q.11 What are the applications of big data in business?

Ans. Application of big Data in Business

After data applications can help companies to make better business decisions by analyzing large volumes of data and discovering hidden patterns. The following area a few business domains where big data can be applied.

1. Healthcare
2. Media and Entertainment
3. IoT
4. Manufacturing
5. Government

Healthcare

Big data is making major impact on the huge healthcare industry. Wearable devices and sensors collect patient data which is then fed in real-time to an individual's electronic health records. Healthcare providers are now using big data to predict epidemic outbreaks, real-time alerting, predict and prevent serious medical conditions etc. Researchers analyze the data to determine the best treatment for a particular disease, side effects of the drugs, forecasting the health risks, etc.

Media and Entertainment

The media and entertainment industries are creating, advertising, and distributing their content using new business models. The media houses are targeting audiences by predicting what they would like to see, how to targets the ads, content monetization, etc. big data systems are thus increasing the revenues of media houses by analyzing viewer patterns.

Internet of Things (IOT)

Big plays an important role in enhancing the capabilities of IOT devices. IOT devices generate continuous data. The analytics based on this huge data helps in personalized customer experience. In brief, big data is essential for unlocking the full potential of IOT by providing meaningful insight derived from the massive amount of data generated by IOT devices.

Manufacturing

Big data helps the manufacturing companies to make better products and smarter decisions. It helps in predicting when machines might need a break (predictive maintenance), making sure they don't unexpectedly stop working.

The following are some of the major advantages of employing big data applications in manufacturing industries:

- High product quality
- Tracking faults
- Supply planning
- Predicting the output
- Increasing energy efficiency
- Testing and simulation of new manufacturing process
- Largest scale customization of manufacturing

Government

Analytics through big data management techniques allows governments to understand the needs of their citizens, combat fraud, minimize system errors and improve operations, reducing costs and improving the services of any government entity.

Big data applications can be applied in each and everywhere big data finds applications include:

- Agriculture
- Aviation
- Cyber security and intelligence

- Crime prediction and prevention
- E-commerce
- Fake news detection
- Fraud detection
- Pharmaceutical drug evaluation
- Weather forecasting
- Tax compliance

Multiple Choice Questions Answers

Select the suitable answer for the following Multiple choice questions.

1. Which is one of the key applications of big data in business?
   (a) Social media management
   (b) Customer behavior analysis
   (c) Weather forecasting
   (d) Artistic creativity
2. What is the role of predictive modeling in utilizing big data?
   (a) It helps collect data from various sources.
   (b) It organize data into a structured format
   (c) It uses data to make informed predictions about the future.
   (d) It visualize data through charts and graphs
3. Which of the following is not a valid example of a sensor application?
   (a) GPS in a smartphone
   (b) Temperature sensor in a weather station
   (c) Motion sensor in a security system
   (d) Social media platform for data analysis
4. What is the main distinction between interval scaled and ratio scaled attributes?
   (a) Interval scaled attributes have a meaningful zero point.
   (b) Ratio scaled attributes have equal intervals.
   (c) Interval scaled attributes represent counts
   (d) Ratio scaled attributes have gaps between values
5. How many types of data analysis are available?
   (a) 1 (b) 3
   (c) 2 (d) None of these
6. Which statistical measure provides a measure of the central tendency of a dataset?
   (a) Standard deviation
   (b) Variance
   (c)Mean
   (d) Median
7. Which cloud platform provides storage and processing capabilities for IoT data?
   (a) Azure (b) Facebook
   (c) WhatsApp (d) Instagram
8. What is the primary purpose of exploratory data analysis (EDA)?
   (a) To confirm preconceived hypotheses
   (b) To summarize the main findings of a study
   (c) To explore data sets, detect patterns, and identify anomalies (Correct answer)
   (d) To visualize data in a clear and concise manner
9. What is the primary function of data collection in the context of data science?
   (a) Data analysis
   (b) Data storage
   (c) Data generation
   (d) Data retrieval
10. Which industry heavily relies on IoT for supply chain optimization and resource allocation?
    (a) Healthcare
    (b) Finance
    (c) Retail
    (d) Transportation
11. What is the primary purpose of data

visualization in data science?
(a) Data Collection
(b) Data exploration
(c) Extracting insights
(d) Data modeling

12. Which type of data attribute represents categories with a specific order but inconsistent intervals between them?
(a) Nominal (b) Binary
(c) Ordinal (d) Interval

13. Which of the following is an example of interval scaled attribute?
(a) Age
(b) Temperature in Celsius
(c) Height
(d) Weight

14. Which of the following is not one of the characteristics of big data?
(a) Veracity (b) Velocity
(c) Validity (d) Volume

15. How does data science add value to big data?
(a) By creating more data
(b) By making data storage more efficient
(c) By extracting insights and predictions from data
(d) By ensuring data quality and consistency

16. In machine learning, what does the term "overfitting" refer to?
(a) When the model is too simple to capture the underlying patterns in the data
(b) When the model performs well on the training data but poorly on unseen data
(c) When the model performs equally well on both training and test data
(d) When the model is too complex and memorizes noise in the training data

17. Which one of the following is not a type of data format?
(a) Numerical (b) Categorical
(c) Image (d) Sensor

18. In the context of big data, what does the 3Vs refer to?
(a) Veracity, Velocity, Veracity
(b) Volume , Value, Velocity
(c) Validity, Variety, Volume
(d) Variety, Velocity, Volume

19. What is the primary goal of data collection in data science?
(a) Building machine learning models
(b) Extracting insights from data
(c) Storing data in databases
(d) Enhancing data privacy

20. Which of the following key concepts involves transforming raw data into a structured format that is suitable for analysis?
(a) Data modeling
(b) Data exploration
(c) Data collection
(d) Data ethics

21. What is the role of domain knowledge in data science?
(a) Writing code for data analysis
(b) Conducting statistical tests
(c)Understanding the specific context of data
(d) Visualizing data

22. In data science, what is the primary purpose of data exploration?
(a) Data visualization
(b) Data cleaning
(c) Extracting insights
(d) Data storage

23. Which step in the data science process involves selecting the most relevant features or variables for analysis?
(a) Data collection
(b) Feature engineering
(c) Data modeling
(d) Data visualization

24. What is the main goal of machine learning in data science?
(a) Data visualization
(b) Descriptive statistics
(c) Predictive modeling
(d) Data cleaning

25. Which big data technology is commonly used to store and process large datasets in a distributed manner?
(a) SQL databases
(b) Hadoop

(c) Relational databases
(d) Data warehouses

26. Which of the following best describes the concept of big data?
(a) Data that is stored in traditional databases
(b) Data that is too small to be analyzed effectively
(c) Data that is characterized by high volume, velocity, and variety
(d) Data that is only generated by social media platforms

27. What is the primary challenge associated with traditional data processing techniques when dealing with big data?
(a) Lack of storage capacity
(b) Slow processing speed
(c) Inability to handle diverse data types and large volumes
(d) Limited availability of data visualization tools

28. Which technology is commonly used to process and analyze big data in real-time?
(a) Relational databases
(b) Data warehouses
(c) Apache Hadoop
(d) Apache Spark

29. What does the term "data silos" refer to in the context of big data?
(a) High-quality data sources
(b) Data that is stored in a structured format
(c) Data that is isolated within different departments or systems
(d) Data that is easily accessible by all stakeholders

30. Which of the following is a potential benefit of implementing big data analytics in business?
(a) Decreased data security
(b) Reduced need for skilled analysts
(c) Improved decision-making based on data-driven insights
(d) Increased reliance on gut instinct for decision-making

31. Which programming language is commonly used for big data analytics and machine learning tasks?
(a) Java
(b) Python
(c) C++
(d) Ruby

32. What is the primary purpose of data preprocessing in big data analytics?
(a) To increase data storage costs
(b) To reduce the volume of data
(c) To prepare raw data for analysis
(d) To eliminate the need for data visualization

33. Which of the following is NOT a typical component of the Apache Hadoop ecosystem?
(a) HBase
(b) Apache Kafka
(c) Apache Hive
(d) Apache Spark

34. What is the main advantage of using distributed computing frameworks like Apache Hadoop for big data processing?
(a) They require minimal hardware resources
(b) They offer low data processing speed
(c) They enable parallel processing of large datasets across multiple nodes
(d) They are primarily used for online transaction processing (OLTP)

35. Which of the following best describes the role of cloud computing in IoT?
(a) Cloud computing is not relevant to IoT
(b) Cloud computing provides a centralized platform for processing and analyzing data generated by IoT devices
(c) Cloud computing is used only for storing IoT device firmware
(d) Cloud computing is solely responsible for managing IoT device connectivity

36. What is the primary advantage of using cloud computing for IoT applications?
(a) Decreased latency in data processing
(b) Reduced dependence on internet connectivity
(c) Scalability and flexibility in handling large volumes of IoT data

(d) Enhanced security for IoT devices

37. Which cloud service model is commonly used for hosting IoT applications and services?

(a) Infrastructure as a Service (IaaS)
(b) Platform as a Service (PaaS)
(c) Software as a Service (SaaS)
(d) Function as a Service (FaaS)

ANSWERS

1	b	2	c	3	d	4	b	5	c	6	c	7	a
8	c	9	c	10	d	11	c	12	c	13	b	14	c
15	c	16	b	17	d	18	d	19	b	20	a	21	c
22	c	23	b	24	c	25	b	26	c	27	c	28	d
29	c	30	c	31	b	32	c	33	d	34	c	35	b
36	c	37	b										

Short Questions Answers

Q.1 What is computer system?

Ans. A computer system is a fundamental and important part of modern life. It has revolutionized the way we work, communicate, learn, and entertain ourselves. In today's world, we are surrounded by a lot of data, which may be on our computer system or otherwise.

Q.2 Define Data science.

Ans. Data science is the branch of knowledge, in which computer programming skills along with mathematics and statistics is used to extract meaningful information from collection of data e.g. medical, education etc.

Q.3 What do you mean by data?

Ans. Data is a collection of information or facts that we gather about something. It can be represented by numbers, measurements, descriptions, sounds or pictures. Here, is examples of data. In a science experiment when you record the temperatures at different times, that temperature values are data.

Q.4 What is dataset?

Ans. Data set is a structured or processed collection of data usually associated with a unique body of work. This collection of data is related to each other in some way, for example a collection of branch CT scan of brain tumor patients is a dataset which can be used to evaluate certain pattern or trend common in the entire dataset.

Q.5 Define the term Statistics and Probability?

Ans. Statistics is the analysis of the frequency of past events and probability is to predict the likelihood of future events. Statistics is used in various fields such as science, business, economics, social sciences, and more, to understand patterns, trends, and relationships within data. Data scientists use statistics and probability to find patterns and trends in the data.

Q.6 What is data mining?

Ans. Data mining is the subset of data science which primarily focuses on discovering patterns and relationships in existing datasets. The usage of technique and tools is limited in data mining as compared to data science.

Q.7 Describe the uses of Natural Language Processing (NLP)?

Ans. It is the study of interaction between human language and computers. The common uses of NLP are chatbots, language translators and sentiments analysis.

Q.8 What is stock market?

Ans. The stock market is a platform where buyers and sellers come together to trade shares of publicly listed companies. It's essentially a marketplace for securities, which

include stocks, bonds, and derivatives.
Data science techniques and tools can be helpful in algorithmic trading, market sentiment analysis, volatility predictions.

Q.9 Define E-Commerce.

Ans. E-commerce, short for electronic commerce, refers to the buying and selling of goods and services over the internet. It encompasses a wide range of online transactions, including retail sales, business-to-business (B2B) transactions, online auctions, and digital downloads of products like software, music, and books.

Q.10 Differentiate between discrete and continuous data.

Ans. In statistics, there are two forms of data: discrete and continuous data, each of which have distinct features.

Discrete data

Discrete data consists of distinct values. It is countable and finite, which means it can only accept certain numerical values. Examples include the number of students in a classroom, cars in a parking lot, and books on a shelf.

Continuous data

Continuous data refers to measurements that can have any value within a certain range. It is infinitely divisible, which means it can take on any number of values within a given range.
Examples include height, weight, temperature, and time.

Q.11 Define DBMS.

Ans. DBMS (Database Management System) is the interface between the database and the end user, providing a platform to create, modify, and retrieve data. There are many different database management systems available, depending on the type of data base being used.

Q.12 What is Survey?

Ans. It is a method of collecting information from individuals. The basic purpose of a survey is to collect data to describe different characteristics such as usefulness, quality, price, kindness, etc. it involves asking questions about a product or service form many people.

Q.13 Describe the role of data science.

Ans. Data Science plays a crucial role in determining the place of various products in various shelves of the supermarket. For example, the information gathered from the database will guide us to place the products with less shelf life in the most easily accessible shelves.

Q.14 How the process of data collecting can be measured?

Ans. Data collection is the systematic process of gathering, documenting, and organizing data from a variety of sources in order to extract significant insights, facilitate informed decision-making, or allow for rigorous analysis.

Q.15 Distinguishes between Primary data collection and secondary data collection.

Ans. Primary data collection It involves the collection of original data directly from the data source or via direct interaction with the respondent. Some common primary data collection methods are as follows:

i) Surveys and Questionnaires
ii) Interviews

Secondary data collection. It involves data collection using existing data collected by someone else for some purpose. Some common secondary data collection methods are as follows:

i) Published sources ii) Online databases

Q.16 Who are the Investigators and Enumerators?

Ans. Investigators: An investigator is a person who conducts the statistical enquiry.

Enumerators: While to collect information for analysis, an investigator needs the help of some people. These people are known as enumerators.

Q.17 Describe data visualization.

Ans. Data visualization is graphical representation of data to get meaningful insight, trends, and patterns from data. The visual elements which help in data

visualization are charts, graphs, maps, figures and dashboard etc.

Q.18 What do you know about summary statistics?

Ans. It is information about the data in a sample. It can help understand the values better. It may include the total number of values, minimum value, and maximum value, along with the mean value and the standard deviation corresponding to a data collection.

Q.19 What are the three Vs of big data?

Ans. The three Vs of big data are:

Volume

It refers to the amount of data. Big data deals with huge volumes of low-density, unstructured data. For others, it may be hundreds of petabytes.

Velocity

It refers to the speed of data velocity is the fast rate at which data is received. Normally, the highest velocity of data streams directly into memory rather than being written to disk. Some internet-enabled smart products operate in the real-time and will require real-time evaluation and action.

Variety

It refers to the various formats and types of data that are available. Traditional data types were structured and fit neatly in a relational database. With the rise of big data, data comes in new data types. These unstructured data (text, images, videos) and semi structured data (JSON, XML) types require additional preprocessing to derive meaningful insight.

Q.20 Describe the history of big data in short.

Ans. The term big data emerged in the early 2000s as a term to describe exponential growth of data. Around 2005, people began to realize just how much data users generated through data. Around 2005, people began to realize just how much data users generated through face-book, YouTube, and other online services.

Q.21 Describe any two benefits of big data.

Ans. Predictive Maintenance

It is a maintenance strategy that uses the analysis of existing data to predict when equipment, machinery or product is likely to fail. Therefore, it indicates the potential issues before the problems happen.

Fraud and Compliance

Big data analytics can identify and detect unusual suspicious patterns and anomalies. As a result, provides an effective tool to detect fraudulent activities and enhance cyber security measures.

Q.22 Make list of challenges occurred from big data.

Ans. Here is the list of big data challenges:

- Data Quality
- Data Security and Privacy
- Rapid growth of Data
- Big Data Tool Selection
- Data integration

Q.23 Define the term data Integration.

Ans. Data integration is the process of merging data from several sources to create a cohesive picture, which is typically stored in a single database, data warehouse, or data lake. This process entails collecting data from diverse systems, applications, or databases.

Q.24 What are the applications of big data in business?

Ans. The following area a few business domains where big data can be applied.

1. Healthcare
2. Media and Entertainment
3. IoT (Internet of Things)
4. Manufacturing
5. Government

Q.25 Describe the role of big data in Internet of Things (IoT).

Ans. Big data plays a significant role in the Internet of Things (IoT) ecosystem by enabling the collection, storage, processing, and analysis of massive volumes of data generated by IoT devices. IOT devices generate continuous data. The analytics based on this huge data helps in personalized customer experience.

SOLVED EXERCISE

Multiple Choice Questions

Select the suitable answer for the following questions.

1. _____ is a structured or processed collection of data usually associated with a unique body of work.
   (a) Data base (b) Dataset
   (c) Data and Information (d) Information
2. _____ refers to the process of carefully examining and studying data to identify patterns, draw conclusions, or make the data meaningful.
   (a) Data analytics
   (b) Data predictions
   (c) Dataset
   (d) Database
3. _____ is the graphical representation of data through use of common charts, plots, infographics and animations
   (a) Data cleaning
   (b) Missing values
   (c) Data visualization
   (d) Data hiding
4. _____ is subset of machine learning, with emphasis on the simulation or imitation of human brain's behavior by using artificial neural network.
   (a) data visualization
   (b) Computer vision
   (c) Deep learning
   (d) Big Data
5. _____ is the use of data to predict future trends and events based on historical data.
   (a) Statistical analysis
   (b) Predictive analysis
   (c) Graphical analysis
   (d) Deep learning
6. _____ is the fast rate at which data is received and acted on.
   (a) Volume (b) Velocity
   (c) Variety (d) Vision
7. _____ includes the data which can only take certain values and cannot be further subdivided into smaller units.
   (a) Statistical data
   (b) Continuous data
   (c) Ordinal data
   (d) Referral data
8. _____ is limitation of big data.
   (a) Statistical data
   (b) Unlimited growth of data
   (c) Data visualization
   (d) Predictive maintenance
9. Customer satisfaction level such as satisfied, dissatisfied, and neutral are examples of _____ data type.
   (a) Ordinal data
   (b) Continuous data
   (c) Numerical data
   (d) Discrete data
10. _____ is a method of collecting information from individuals.
    (a) Survey (b) Data hiding
    (c) Data visualization (d) Data finding

ANSWERS

1	b	2	b	3	c	4	c	5	b
6	b	7	c	8	b	9	a	10	a

Short Questions Answers

Q.1 Define data analytics and data science. Are they similar or different? Give reason.

Ans. Data analytics refers to the process of carefully examining and studying data to identify patterns, draw conclusions, or make

the data meaningful. It's like solving puzzle or retrieving meaningful results from the given or collected data.

Q.2 Can you relate how data science is helpful in solving business problems?

Ans. Data science can be applied to various business after analyzing the available data, some of them are:

Industry

Data science can be used to make data driven decisions by analyzing historical data and predicting future trends.

Consumer Goods

Data science skills can be used to optimize inventory according to the demand forecasting of particular goods in particular social groups, communities and demographics.

Q.3 Database is useful in the field of data science. Defend this statement.

Before the advent of database systems, computer scientists relied on file management systems to store and manage data. However, without a structured method of storing data, it would be of little use. This is why databases were introduced to manage and store large amounts of data. The rapid increase in data generation

Q.4 Compare machine learning and deep learning, in the context of format and informal education.

Ans. Machine learning is a branch of artificial intelligence and computer science which emphasizes the use of data and algorithms to imitate human learning by the computers.

Deep learning is the subset of machine learning, with emphasis on the simulation or imitation of human brain's behavior by using artificial neural networks.

Q.5 What is meant by sources of data? Give three sources of data excluding those mentioned in the book.

Ans. To analyze data for predictive analysis and decision making, the initial step is data collection through various reliable sources. Data can be divided into two categories, primary data, and secondary data.

Sources of data:

Sensor Networks: With the growth of Internet of Things (IoT) devices, sensor networks have emerged as a major source of data.

Social media networks such as Twitter, Facebook, Instagram, and LinkedIn collect massive amounts of data through user interactions, posts, comments, shares, and likes.

Web Scraping is the process of obtaining data from websites using automated tools or scripts. This data may include product information, news stories, reviews, pricing data, and more.

Q.6 Differentiate between database and dataset.

Ans. A dataset is a structured or organized collection of data, which is usually associated with a unique body of work. However, a database is an organized collection of data stored in multiple datasets or tables.

Q.7 Argue about the trends, outliers, and distribution of values in a data set? Describe.

Ans. Trends:

Trends in a dataset refer to the overall direction in which data points move over time or across a different dimension. Identifying trends is critical for understanding underlying patterns and making sound judgments.

Outliers:

Outliers are data points that are notably different from the remainder of the dataset. These can occur as a result of measurement errors, experimental variability.

The distribution of values: The distribution of values in a dataset describes how the data is scattered or dispersed among various values or intervals.

Q.8 Why are summary statistics needed?

Ans. The summary statistics provide a quick overview of characteristics of data. It leads towards a better understanding of data cleaning, data preprocessing, feature selection and data visualization.

Q.9 Express big data in your own words. Explain three V's of big data with reference to email data. (Hint.: An email box that contains hundreds of emails)

Ans. Big data is defined as extraordinarily massive and complicated datasets that are difficult to manage, process, and analyze using conventional data processing approaches. These datasets often have three key features, also known as the three V's of big data: volume, velocity, and variety.

There are three Vs of big data are:

Volume

It refers to the amount of data. Big data deals with huge volumes of low-density, unstructured data. The size / volume of data may vary from system to system.

Velocity

It refers to the speed of data velocity is the fast rate at which data is received. Normally, the highest velocity of data streams directly into memory rather than being written to disk.

Variety

It refers to the various formats and types of data that are available. Traditional data types were structured and fit neatly in a relational database.

Q.10 Illustrate the purpose of data storage?

After data collection, effective storage of data is an essential step for managing and analyzing the large volumes of data. Some common data storage methods are as follows:

i) Relational / NoSQL databases
ii) Data warehouse
iii) Distributed file systems
iv) Cloud based data storage
v) Blockchain

Long Questions (Exercise)

Q.1 Sketch the key concepts of data science in your own words.

Ans. Here's a sketch representing the key concepts of data science:

Data Collection: A circle labeled "Data Collection" symbolizes the process of obtaining raw data from a variety of sources, including databases, sensors, social media, and web scraping.

Data Cleaning: An arrow points from "Data Collection" to a circle labeled "Data Cleaning." This idea entails preparing raw data to remove errors, inconsistencies, and irrelevant information, hence improving data quality for analysis.

Data Exploration: Another arrow points from "Data Cleaning" to a circle labeled "Data Exploration." This idea entails analyzing and visualizing data to uncover patterns, trends, and insights that can be used to drive future investigation.

Feature Engineering: A circle named "Feature Engineering" connects to "Data Exploration." This idea entails picking, manipulating, and producing new features or variables from data in order to improve the performance of machine learning models.

Data Modeling: An arrow points from "Feature Engineering" to a circle labeled "Data Modeling." This idea entails creating and training machine learning models to make predictions, classify data, and discover correlations within a dataset.

Evaluation and Validation: An arrow connects "Data Modeling" to the circle labeled "Evaluation and Validation." This idea entails evaluating the performance of machine learning models using metrics like accuracy, precision, recall, and F1-score to verify dependability and generalizability to fresh data.

Deployment: An arrow points from "Evaluation and Validation" to a circle labeled "Deployment." This notion entails incorporating machine learning models into production systems or apps to help make data-driven choices and automate processes.

Continuous Learning: An arrow points from "Deployment" to "Data Collection." This approach exemplifies the iterative nature of data science, in which input from deployed models is used to constantly update and enhance data collecting, cleaning, modeling, and deployment procedures.

Q.2 Develop your own thinking on the various data types used in data science.

Ans. Data science uses a variety of data kinds to gain insights and make sound judgments. Here's my take on some typical data types used in data science:

Numerical data: Numerical data comprises both continuous (e.g., height, weight) and discrete (e.g., counts) numerical values. Mean, median, and standard deviation are common statistical approaches used to examine numerical data. It is essential for operations such as regression analysis, forecasting, and optimization.

Categorical data: Categorical data refers to qualitative variables that have a limited, specified range of values. Examples include gender, color, and product kind. Categorical data is frequently encoded using techniques such as one-hot encoding so that machine learning algorithms can process it efficiently.

Ordinal data: Ordinal data is comparable to categorical data, but it has a distinct order or ranking of the categories. Examples include rating scales (1 to 5 stars) and educational levels (high school, undergraduate, graduate). Ordinal regression, for example, can be used to analyze ordinal data while keeping the inherent order in mind.

Text data: Textual data is abundant in a variety of formats, including documents, tweets, and reviews. Text analysis approaches include natural language processing (NLP), sentiment analysis, and text mining. Text data preprocessing is required to manage issues such as tokenization, stemming, and stop word removal.

Picture Data: With the advent of computer vision applications, picture data has become increasingly important. It is utilized in a variety of applications, including healthcare (medical imaging), autonomous cars, and surveillance. Convolution neural networks (CNNs) are commonly used for image categorization, object recognition, and segmentation.

Audio data It includes sound and speech signals. It's utilized for things like voice recognition, audio classification, and music analysis. Audio data is processed using Fourier transforms, spectrograms, and deep learning models such as recurrent neural networks (RNNs).

Binary data It consists of 0s and 1s. It is widely used in domains such as computer networking, cryptography, and digital forensics. Binary data processing entails bitwise operations, binary classification algorithms, and methods for dealing with binary-encoded information.

Q.3 Compare how big data is applicable to various fields of life. Illustrate your answer with suitable examples.

Ans. (Long question # 11, Pg. # 99-101)

Q.4 Relate the advantages and challenges of big data?

Ans. (Long question # 10, Pg. # 99)

Q.5 Design a case study about how data science and big data has revolutionized the field of healthcare.

Ans. Introduction

Data science and big data analytics have transformed healthcare by improving disease diagnosis, therapy development, and patient outcomes. This case study examines the influence of data science and big data in a fictitious healthcare business, focusing on important efforts, problems, and outcomes.

Initiative:

ABC Healthcare has started a data science and big data program to improve patient care, optimize operations, and promote healthcare innovation. The effort included the following major components:

Data Integration

ABC Healthcare used data from electronic health records (EHRs), medical imaging systems (MIS), wearable devices, and other sources to build a single data repository.

Predictive Analytics

ABC Healthcare used machine learning algorithms to create prediction models that identify individuals who are at risk of developing chronic illnesses like diabetes and heart disease. These models enabled doctors to intervene early and execute preventive strategies that improved patient outcomes.

Personalized Medicine:

ABC Healthcare created individualized treatment programs based on patient data, including genetic information and treatment histories, to match each patient's unique traits.

Healthcare

Big data is making major impact on the huge healthcare industry. Wearable devices and sensors collect patient data which is then fed in real-time to an individual's electronic health records. Healthcare providers are now using big data to predict epidemic outbreaks, real-time alerting, predict and prevent serious medical conditions etc. Researchers analyze the data to determine the best treatment for a particular disease, side effects of the drugs, forecasting the health risks, etc.

Activity-1

Conduct a Survey

Objective: To help students understand the process of data collection through survey and questionnaires

i) Provide the class with a sample questionnaire about the sentiments analysis of small enterprises. Sample questions may include, why did you choose this business /occupation? How do you manage to meet the market competition? What limitations do you feel about your business? What short term and long-term goals/objectives have you set regarding your business?

ii) Ask the students to modify the questionnaire according to their favorite business / occupation. Help the students in modifying the questionnaire.

iii) Arrange a field trip or ask the students to get it filled by asking questions from relevant shopkeepers around them.

iv) Let the students arrange collected data and organize it for the next activity.

Outcome: The activity will help students understand various businesses / occupations around them as well as understand the opportunities and shortcoming regarding various businesses.

Ans. Practical / Lab work

Activity-2

Data Visualization

Objective: To help students understand the process of data visualization.

i) Ask the class to make groups according to the professions about which they conducted survey. Group similar professions according to their nature.

ii) Ask the students to plot the data by using charts and graphs. They can use software tools if available.

iii) Let the students draw conclusions about various professions and what are the sentiments of business owners about their business.

iv) Ask the students to add modifications to the current businesses model to overcome the existing shortcomings.

Outcomes: This activity will help students understand data visualization and how it is helpful for

decision making to improve it and make new strategies or modifying the existing one.

Ans. Practical / Lab work

Activity-3

Conduct a survey:

Objective: To help students understand the importance of data collection to get insight about data.

i) Divide the class into small groups (5 to 6 students) and assign each a business topic, preferably from their own surroundings, so that students have appropriate information about it.

ii) Instruct each group to write a case study, that how that business can be related to big data.

iii) Each group will present their case study and other groups can ask questions about it, try to keep it a supervised interactive session.

Outcome: This activity will help students understand the relationship and impact big data on various business.

Ans. Practical / Lab work

UNIT 05 APPLICATIONS OF COMPUTER SCIENCE

Long Questions

Q.1 Describe the concept of artificial intelligence and machine learning.

Ans. Artificial Intelligence

Artificial Intelligence (AI) is a branch of computer science to make computer-controlled machines that can intelligently perform human-like tasks. Using AI-based machines is like fixing an intelligent brain in the machines that has decision-making capabilities to solve complex problems.

Using AI technology, computer can be trained to perform various tasks by imitating actions of human beings. It is the technology related with making intelligent machines and developing intelligent software.

Machine learning (ML)

Machine learning is a field within Artificial Intelligence that teaches computers to learn from data inputs and experience like humans without direct programming. AI algorithms are based on ML to predict output. Machine learning algorithms facilitate computers to train on data inputs and analyze it to produce accurate output values. It is the technology that recognizes patterns in large data bases to build models to automate decision-making. Machine learning algorithms improve their decision-making capabilities over time as more sample data is input in the computers.

Types of Machine Learning

There are two types of machine learning, that is, supervised and unsupervised machine earning.

Supervised Machine Learning

Supervised learning algorithms take a set of known input data and known output responses to build a model to make predictions. In supervised learning the goal is to learn how to do the mapping to match the input to the output. Once the model is built, it is used to make new predictions on unseen data as well.

Did You Know?
The term "Artificial Intelligence" was coined by ***John McCarthy,*** *a computer scientist, at the Dartmouth Conference in* ***1956.***

For example, assume that we want to predict price of a car. In this case we need to create a dataset of cars having the input like.

- Engine type and power
- Transmission type (manual / automatic)
- Number of seats
- Front-wheel / rear-wheel drive

Unsupervised Machine Learning

In unsupervised learning, the training data is unseen and it is un-labelled. The meaning of un-labelled is that the data is not assigned a category or group. The unseen data is fed into machine learning algorithm to train the model. For example, a bank wants to predict how capable an applicant is of repaying the

Fig. 5.1: Machine learning process

loan. A machine learning system is to be set up to ensure that the loan is given to the applicant who can repay it.

The machine learning process consists of 5 stages as shown in Fig. 5.1.

a) Collection of training data
b) Creating algorithm
c) Learning process
d) Creating training model
e) Predicting results

AI machine learning algorithms shown in Fig.5.2 can make errors and produce wrong results as they do not apply formulas like traditional algorithms.

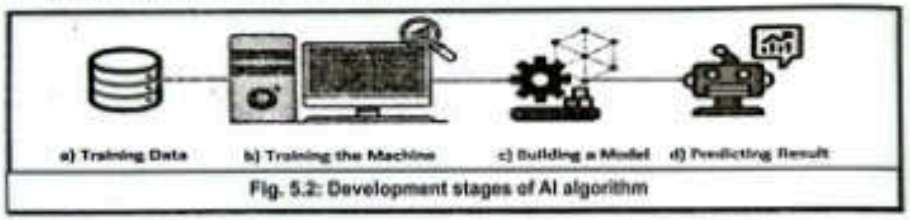


Fig. 5.2: Development stages of AI algorithm

Q.2 What are the drawbacks of AI Algorithms?

Ans. The following are some harm or disadvantages of AI-algorithms:

- AI-algorithms are developed by humans who can intentionally or unintentionally introduce bias in them. These algorithms can produce bias results that can lead to discriminatory consequences on the grounds such as ethnicity, gender or age.
- Driverless self-driving car can have an accident. This shows how AI algorithms can cause death.
- Errors in AI algorithms in healthcare systems can output inaccurate information. For example, the AI system can recommend a wrong medicine for a patient which can be very harmful and can even cause death.
- Hackers can develop powerful AI algorithms to bypass cybersecurity and cause malicious cyberattacks.
- AI based automation can lead job losses in many areas such as automobile manufacturing, business, education, healthcare, agriculture, etc.
- Dependence on AI systems can cause loss of creativity and critical thinking skills in human.
- Unexpected behavior of AI systems can result in having negative impact on individuals and society as a whole. AI systems that do not observe human values can lead to big disasters.

Q.3 How does AI contribute to improving people's lives?

Ans. Designers of AI-algorithm must instill moral and ethical values in AI-systems and focus on benefiting people.

There are many benefits AI-systems. Utilizations of AI based systems is transforming our day-to-day activities and improving our life style. It helps in solving many complex problems that depended on human intelligence in the past.

The following are come important benefits of using AI-systems.

- AI based systems make correct decisions and help us in solving complex problems efficiently and increase productivity.
- AI systems used in hospital provide better diagnosis and treatment of diseases at early stage such as cancer.

- Help in design and production of high quality products and increase production in safe environment.
- Help in travel and transportation by suggesting shortest routes for the drivers and inform about traffic conditions in real time.
- Correct decision making helps in improving marketing, sales and enhance customer satisfaction.
- Help in developing better learning software and introduce new teaching techniques.
- Usage of AI based assistants such as Siri and Alexa, suggest products by monitoring our browsing habits.
- Provide better security against cyberattacks.
- Enable new innovations in developing intelligent computer software.

Q.4 What are some ethical concerns raised by the widespread implementation of AI tools?

Ans. AI tool is an intelligent application software used solve problems. It analyzes vast amount of training data and makes predictions to solve problems efficiently and improve productivity.

Fig. 5.3: Use of ChatGPT

Brief Description of Some Popular AI Tools and their Ethical Issues

ChatGPT

ChatGPT stands for Chat Generative Pre-trained transformer developed by Open AI, Open AI is an American Artificial Intelligence Research Laboratory. ChatGPT helps in performing tasks such as creating essays, emails and coding. It is an easy to use virtual assistant that provides text-based responses to users' questions. It is a very useful AI tool but it raises some ethical issues as well. Ethical issues include harm due to misinformation, cheating and plagiarism in schools and universities that can have negative impact on teaching / learning process and assessment of students' work. It also has issues such as bias, discrimination, data privacy and security. Fig. 5.3 shows the use of ChatGPT.

Grammarly

It is an AI tool for correcting spelling and grammar mistakes in documents. It provides a safe platform for improving writing skills. To check a documents or piece of writing, you copy and paste it into a form and then Grammarly automatically checks it. It protects users' data that is checked for correction and prevents unauthorized access to their account. It is not a perfect tool as it has some inaccuracy issues. It does not catch every mistake and some suggestions it gives may not be correct. Since it is not 100% accurate, it is not a replacement of manual proofreading.

Lovo *ai*

Lovo ai is a tool based on AI algorithm that converts text to speech. It is the award winning most realistic online text to speech generator. It uses AI techniques to find out the most suitable voice for your text. It supports 500 high quality voices and more than 100 languages. It is an easy to use tool for creating audios and videos for advertizing, marketing, education, training, etc.

Virtual Assistants

Virtual assistant is an interactive AI based application program that can understand natural language. Popular virtual assistants are Apple's Siri, Amazon Alexa, Google Assistant, Chat GPT and Microsoft Cortana. You an ask question to it and it will give you the answer. Virtual assistants have become part of our daily life. It can perform various tasks such as sending text messages, making phone calls, playing music, making purchases, making search queries and creating emails. Fig. 5.4 shows Google Assistant on computer screen.

Fig. 5.4: Google Assistant

Develop of virtual assistants face many ethical challenges. Virtual assistants store information of people who use it.

Q.5 What are the various domains or fields within the realm of AI?

Ans. AI has become very useful technology for saving problems related to many areas. These include healthcare, education, transportation, research and development, customer support, biometrics, fake account verification, advertising and marketing, helping wildlife, cybersecurity, agriculture, business, defense etc. Fig. 5.5 shows application of AI in various areas.

Speech Recognition:

It is used for various purposes. These include dictating text into a computer instead of typing it to save time. It is used by virtual assistants like Siri and Alex. A virtual assistant is a program that takes verbal commands and performs various take on devices such as mobile phone, tablet, smartwatch, etc. There are some disadvantages of using speech recognition. People have different pronunciation and this may make it difficult for the speech recognition system to understand all the words.

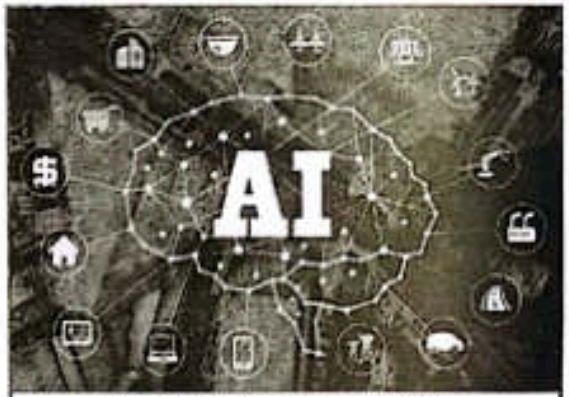


Fig. 5.5 Application of AI in various areas

Computer vision

Computer vision is a field of AI that enables computer systems to obtain meaningful information from digital images videos. To achieve this, it uses camera, data and algorithms.

A large amount of data (images/videos) is fed into the computer. Computer vision applications

repeatedly performs data analysis until it recognizes and distinguishes images. After gaining deep understanding of data, computer system carries out automated actions.

Fig. 5.6 Application of computer vision at road crossing

Fig. 5.7: Application of computer vision of traffic flow analysis

Natural language processing (NLP)

Natural language processing (NLP) is based on AI. It is about giving computers the ability to understand spoken and written words just like we do. The purpose of NLP is to provide easy communication between computers and humans by using natural language. The following are some areas of application of NLP in our daily life.

- Language translation (Google translation)
- Email filtering and spam detection
- Voice recognition
- Web search
- Chatbots
- Personal assistants (Siri, Alexa, Google Assistant)
- Spell and grammar check

Q.6 Describe Expert System in details.

Ans. Expert system is an interactive AI based computer program designed to solve complex problems. It has decision-making ability like human experts. It uses knowledge and reasoning to find solutions of problems related to a specific area.

Application of Expert Systems

The following are some application areas of expert systems.

- Diagnosis in hospitals such as cancer detection
- Loan analysis and fraud detection in finance industry
- Cyber security
- Designing and manufacturing of products such as automobile
- Planning and scheduling projects
- Monitoring operation of a plant.

Development of Expert System

Development of expert system includes the following steps.

- Sufficient amount of knowledge about a specific area is obtained from many experts and fed in the expert system. A knowledge database is created.
- When an end user makes a query, the expert system asks the user to enter required information about it by filling questionnaire.
- The expert system applies rules and reasoning to extract knowledge from the knowledge database and interprets it to find the solution.
- Finally, the expert system will provide the solution to the end user.

Q.7 What are the applications of Artificial Intelligence?

Ans.

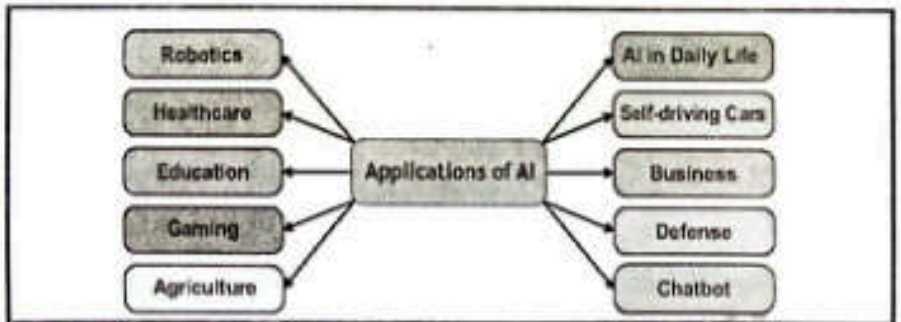


Fig. 5.8: Applications of AI in various areas

Robotics

Robotics is concerned with computer controlled machines that can perform specific tasks with little or no human intervention. A robot is a machine that contains censors, cameras, microphone, control systems, etc. Designing of robot combines mechanical, electrical and structural engineering, mathematics, physics, etc. Fig. 5.9 show application of robotics in automotive industry.

Fig. 5.9: Application of robotics in automotive industry

Healthcare

AI-based software is fed in various machines used in hospitals to help in diagnosis of certain diseases such as cancer. AI based microscope can scan harmful substances and bacteria in samples of blood, AI based patient monitoring systems in ICU help in measuring real-time data such as heart-beat, blood pressure, temperature, etc. that helps doctors in analyzing patient's health conditions. AI software provides personalized interaction between the patient and the hospital in managing health by reducing visits to the hospital, Fig. 5.10 shows application of AI in healthcare.

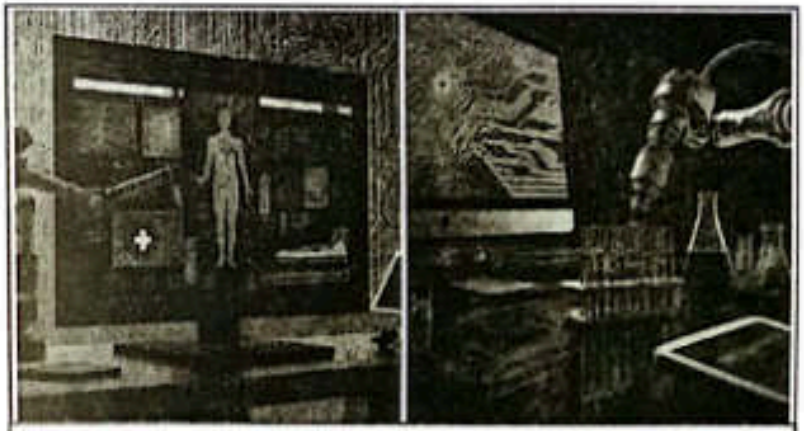


Fig. 5.10: Application of AI in healthcare

Education

AI based systems in education have many benefits for students, teachers and school/university administration. It enhances student's learning and helps teachers to carry out their tasks efficiently to provide quality education. AI based systems adapt to meet each student's individual learning needs. It helps teachers in grading students' assignments, examinations and essays.

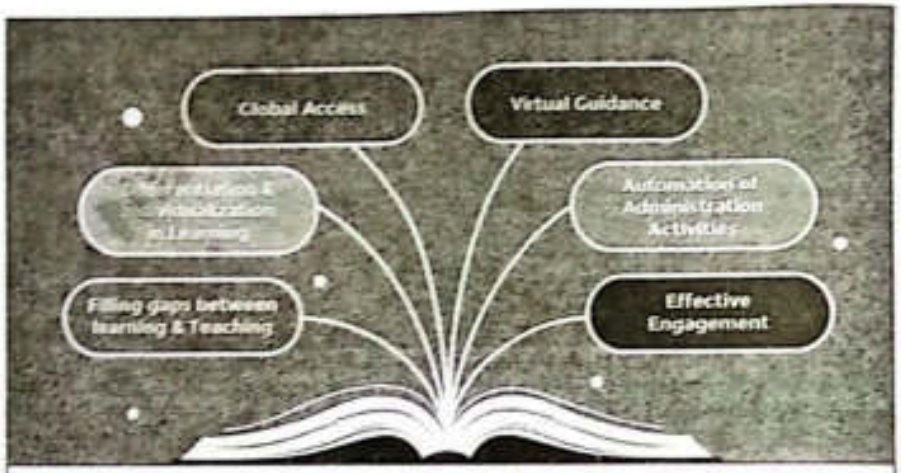


Fig. 5.11: Application of AI in education

Gaming

AI in gaming refers to the uses of computer technology in developing games that give the impression of intelligence and makes the game more challenging, appealing and fun. AI is applied a lot in modern games to make the opponent layer seem intelligent to present a challenge to the player. It creates exciting playing experience to keep the player interested in game.

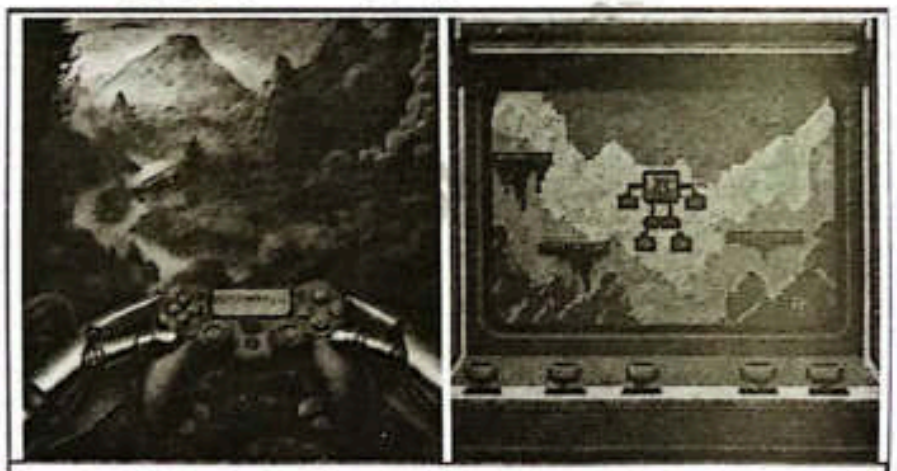


Fig. 5.12: Application of AI in gaming

Agriculture

AI in agriculture refers to using AI based modern techniques to help farmers produce high

quality crops and increase production by using land more efficiently.

To solve the issue of food shortage and livestock in the future, it is important to use AI techniques and innovative farming ideas to increase production on existing farmland.

The following are some benefits of application of AI in agriculture.

Benefits of application of AI:

- AI is used for scanning images of insects that attack crops and livestock to detect and prevent spread of diseases.
- AI can help in monitoring and detecting health problems in livestock using drones, cameras and computer vision to avoid spread of disease.
- AI based drone technology is used for efficient spray of pesticide.

Fig. 5.13: Use of AI drone in agriculture

AI in our Daily Life

AI filters our spam emails by sending them to spam or trash folders and allow us to see only filtered email. Mobile phones and laptops use AI technology for facial recognition for identification purpose to provide secure access.

Self Driving Cars

AI is used to build self-driving cars. Self-driving car uses AI software connected with devices such as sensors, cameras and radars to travel without a driver. Many automobile companies including Audi, BMW, Volkswagen, Tesla, General Motors and Volvo are developing self-driving cars.

Fig. 5.14: Application of AI in self-driving car

Business

AI is used in business in the areas of e-commerce, marketing and business management. AI software is used to run the day-to-day business activities. It has many benefits in business. It helps

people become efficient, improves productivity, and makes accurate decisions. Use of AI in business provides better services to customers, helps in business growth and generates more revenue. It helps in cybersecurity, smart pricing and automated recruitment as well. Fig. 5.15 shows application of AI in business.

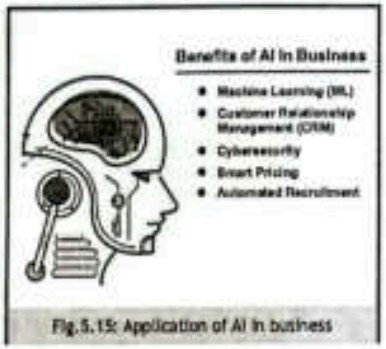


Fig.5.15: Application of AI in business

Defense

AI is used defense security systems to detect threats from hackers to steal confidential information. It helps in finding suspicious activities in computer systems and prevents unauthorized access. It is used in defense to improve surveillance and develop advance arms and ammunitions. It helps in training soldiers in computer simulated wars as well. Fig. 5.16 shows application of AI in armed military drone.

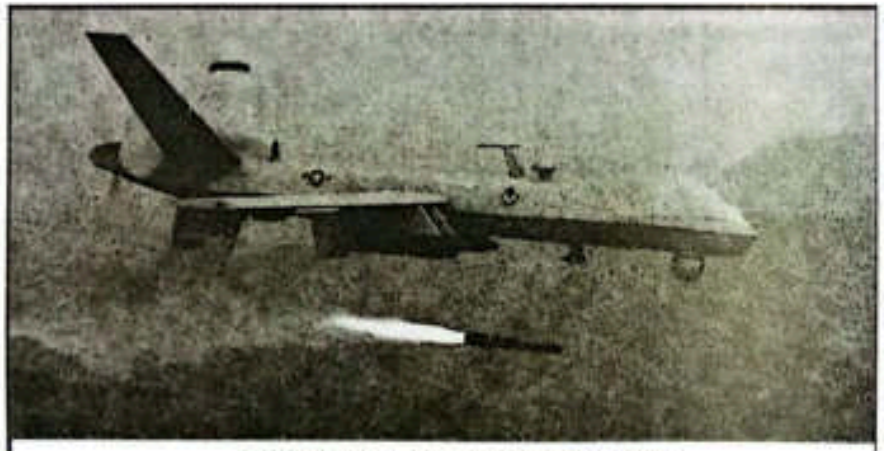


Fig. 5.16: Application of AI in armed military drone

Chatbot

A chatbot is a computer program that combines AI with natural language to provide instant answers to website visitor's questions through text or voice interaction. It mimics human conversation as a virtual assistant and automates responses to customers questions. Chatbots are very beneficial in business.

Did You Know?

Chat-Bot was Created by Joseph Weizenbaum at the MIT Artificial Intelligence Laboratory in the 1960s.

Q.8 What are the fundamentals of cloud computing, and could you detail its different types?

Ans. Cloud computing refers to delivery of computing services over the Internet by cloud computing vendors. These services include servers, storage, databases, networking software etc. Cloud computing enables business and organizations to access databases and cloud applications over the Internet from remote physical servers. It is an alternative to in-house data processing. The Internet becomes the cloud and users can access and process the data with any device that can connect to the Internet anywhere in the world.

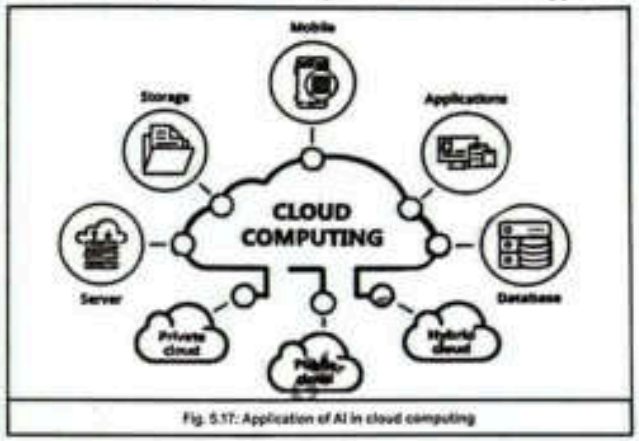


Fig. 5.17: Application of AI in cloud computing

There are three types of cloud computing, that is a public cloud, private cloud and hybrid cloud. Fig. 5.17 shows application of AI in cloud computing.

Public Cloud

In this cloud computing model, resources are owned and operated by a cloud service provider instead of being installed in-house on local devices. The resources that are delivered to businesses and organizations over the Internet include servers, software and storage. These resources are managed and maintained by the cloud service provider. Public cloud provides high speed connectivity to ensure rapid access to application and data.

Private Cloud

In this cloud computing model, resources are owned by and used inside a single organization. In other words, cloud computing is dedicated to a single organization. The user organization is responsible for the operation and maintenance of infrastructure (hardware, software, network, etc.). Private cloud solution provides more control over servers and computer network.

Hybrid Cloud

Hybrid cloud is a combination of public private cloud. This computing model uses technology that allows data and applications to be shared between them.

Multiple Choice Questions

Select the suitable answer for the following Multiple choice questions.

1. What is a potential disadvantage of AI according to the information provided?
   (a) Creativity limitations
   (b) Reduced job loss
   (c) Lowered costs
   (d) Enhanced emotional capabilities

2. How does AI contribute to improving healthcare, as mentioned in the information?
   (a) AI prevents doctors from making any errors during surgeries.
   (b) AI helps in making new discoveries,

such as detecting breast cancer earlier.
(c) AI has no influence on healthcare advancement.
(d) AI is used solely for automating repetitive tasks in healthcare.

3. What is the significant concern regarding the usage of AI in relation to privacy?:
(a) AI has no access to personal data
(b) AI systems are always transparent about data usage
(c) AI might access private information , causing worries about who can use it and how.
(d) AI cannot be used for surveillance purpose.

4. What potential problem arises due to the lack of transparency in AI decision making?
(a) enhance user trust in AI
(b) difficulty in understanding why certain choices are made.
(c) increased efficiency in healthcare and law enforcement
(d) clear understanding of the AI decision making process

5. What is the major ethical concern associated with the use of deep fakes?
(a) Enhancing security measures.
(b) Improving information accuracy
(c) Creating realistic and factual videos
(d) Deceiving people , especially in politics or finance.

6. In what scenario is AI most likely to contribute to spreading misinformation?
(a) AI used for secure data storage
(b) AI incorporated in healthcare systems
(c) AI aiding law enforcement agencies
(d) AI used on social media platforms

7. In which area of AI is facial recognition technology commonly used?
(a) Speech recognition
(b) Computer vision
(c) Natural language processing
(d) Expert system

8. What is the role of AI in drug discovery in the healthcare industry:
(a) AI assists in remote patients monitoring
(b) AI streamlines medical billing processes
(c) AI accelerates drug discovery through predictive modeling
(d) AI enhance medical imaging for diagnoses

9. What is the primary benefit of cloud computing in terms of cost?
(a) It increase upfront infrastructure costs.
(b) It eliminates the need for data backup
(c) It reduces upfront infrastructure costs and allows pay as you go pricing
(d) It is more expensive than traditional on premises solutions

10. What is the primary goal of natural language processing in the field of AI?
(a) Identifying patterns in visual data
(b) Understanding and generating human language
(c) Recognizing facial expressions
(d) Analyzing sensor data

11. In computer vision, which task involves identifying and locating objects within an image?
(a) Speech recognition
(b) Object detection
(c) Image classification
(d) Language translation

12. Which type of machine learning is commonly used for clustering similar data points and dimensionally reduction?
(a) Supervised learning
(b) Unsupervised learning
(c) Reinforcement learning
(d) Deep learning

13. How does AI contributes to the gaming industry? Which aspect of AI is responsible for customizing the gaming experience for players?
(a) AI generate lifelike NPCs and deep learning is responsible for customization
(b) AI generate graphics quality, and supervised learning customizes the gaming experience
(c) AI creates in game content, and reinforcement learning customizes the gaming experience.
(d) AI improves game physics, and natural language processing customizes the gaming experience.

14. Which of the following describes a common application of AI in customer service?
(a) AI predicting financial trends
(b) AI generating automated responses through chatbots
(c) AI analyzing satellite images
(d) AI creating personalized advertisements

15. In what way can AI be used to improve manufacturing processes?
(a) AI generating design patterns
(b) AI automating assembly lines and quality control
(c) AI translating technical documents
(d) AI creating marketing strategies

16. What is a key concern about using AI for hiring and recruitment?
(a) AI might reduce job loss
(b) AI might introduce or amplify biases in hiring decisions
(c) AI could lower the cost of recruitment
(d) AI could improve workplace diversity

17. How does AI contribute to the field of cybersecurity?
(a) AI automates repetitive administrative tasks
(b) AI enhances threat detection and response
(c) AI manages customer interactions
(d) AI monitors physical security systems

18. In what way does AI help e-commerce companies?
(a) AI improves website load times
(b) AI creates personalized product recommendations
(c) AI manages inventory in physical stores
(d) AI develops new manufacturing techniques

19. Which of the following best describes a key advantage of cloud computing for businesses?
(a) Reduced flexibility in scaling resources
(b) Ability to scale resources on demand
(c) Higher upfront infrastructure costs
(d) Need for extensive in-house maintenance

20. What is a primary feature of Infrastructure as a Service (IaaS) in cloud computing?
(a) Providing a complete software solution for customers
(b) Offering virtualized hardware resources like servers and storage
(c) Managing all aspects of a company's IT infrastructure
(d) Delivering specific applications over the internet

21. Which type of cloud deployment allows a company to maintain some resources on-premises while utilizing cloud services for others?
(a) Public cloud
(b) Private cloud
(c) Hybrid cloud
(d) Community cloud

22. What is the primary role of a cloud service provider?
(a) To offer software applications to end users
(b) To provide infrastructure and services in a cloud environment
(c) To create business-specific applications
(d) To manage IT support for a company

23. Which of the following describes a benefit of using Software as a Service (SaaS)?
(a) Users need to maintain their own software installations
(b) Software is hosted and managed by a third party
(c) Complete control over server configurations
(d) Ability to customize underlying infrastructure

ANSWERS

1.	a	2.	b	3.	c	4.	b	5.	d	6.	d	7.	b
8.	c	9.	c	10.	b	11.	b	12.	b	13.	c	14.	b
15.	b	16.	b	17.	b	18.	b	19.	b	20.	b	21.	c
22.	b	23.	b										

Short Questions Answers

Q.1: What is Artificial Intelligence?

Ans. Artificial Intelligence (AI) is a branch of computer science to make computer-controlled machines that can intelligently perform human-like tasks. Using AI-based machines is like fixing an intelligent brain in the machines that has decision-making capabilities to solve complex problems.

Q.2: What do you know about Machine learning?

Ans. Machine learning is a field within Artificial Intelligence that teaches computers to learn from data inputs and experience like humans without direct programming. AI algorithms are based on ML to predict output. Machine learning algorithms facilitate computers to train on data inputs and analyze it to produce accurate output values.

Q.3: What inputs you will choose while predicting the price of a car?

Ans. For example, assume that we want to predict price of a car. In this case we need to create a dataset of cars having the input like.

- Engine type and power
- Transmission type (manual / automatic)
- Number of seats
- Front-wheel / rear-wheel drive
- Keyless entry
- Push button start

Q.4: What are the 5 stages of machine learning process?

Ans. The machine learning process consists of 5 stages.

a) Collection of training data
b) Creating algorithm
c) Learning process
d) Creating training model
e) Predicting results

Q.5: Describe any two disadvantages of AI Algorithm?

Ans.

- AI based automation can lead job losses in many areas such as automobile manufacturing, business, education, healthcare, agriculture, etc.
- Errors in AI algorithms in healthcare systems can output inaccurate information. For example, the AI system can recommend a wrong medicine for a patient which can be very harmful and can even cause death.

Q.6: Mention any Three usages/benefits of AI Systems?

Ans. The following are some important benefits of using AI systems.

- Usage of AI based assistants such as Siri and Alexa, suggest products by monitoring our browsing habits.
- Provide better security against cyberattacks.
- Enable new innovations in developing intelligent computer software.

Q.7: What are the most popular AI tools? Make list.

Ans. Here are some most popular AI tools:

- ChatGPT
- Grammarly
- Lovo ai
- Virtual Assistants

Q.8: What is ChatGPT?

Ans. ChatGPT stands for Chat Generative Pre-trained transformer developed by Open AI. Open AI is an American Artificial Intelligence Research Laboratory. ChatGPT helps in performing tasks such as creating essays, emails and coding.

Q.9: What do you know about Virtual Assistant?

Ans. Virtual assistant is an interactive AI based application program that can understand natural language. Popular virtual assistants are Apple's Siri, Amazon Alexa, Google Assistant, Chat GPT and Microsoft Cortana. You ask question to it and it will give you the answer.

Q.10: Describe the term "Lovo ai".

Ans. Lovo ai is a tool based on AI algorithm that converts text to speech. It is the award winning most realistic online text to speech generator. It uses AI techniques to find out the most suitable voice for your text. It supports 500 high quality voices and more than 100 languages.

Q.11: How speech Recognition works?

Ans. It is used for various purposes. These include dictating text into a computer instead of typing it to save time. It is used by virtual assistants like Siri and Alex. A virtual assistant is a program that takes verbal commands and performs various take on devices such as mobile phone, tablet, smartwatch, etc.

Q.12: What is computer vision?

Ans. Computer vision is a field of AI that enables computer systems to obtain meaningful information from digital images videos. To achieve this, it uses camera, data and algorithms.

A large amount of data (images/videos) is fed into the computer. Computer vision applications repeatedly performs data analysis until it recognizes and distinguishes images.

Q.13: What do you mean by Natural Language Processing (NLP)?

Ans. Natural language processing (NLP) is based on AI. It is about giving computers the ability to understand spoken and written words just like we do. The purpose of NLP is to provide easy communication between computers and humans by using natural language.

Q.14: What are the areas of application of NLP in our daily life?

Ans. The following are some areas of application of NLP in our daily life.

- Language translation (Google translation)
- Email filtering and spam detection
- Voice recognition
- Web search
- Chatbots
- Personal assistants (Siri, Alexa, Google Assistant)

Q.15: Describe some application areas of expert systems?

Ans. The following are some application areas of expert systems.

- Diagnosis in hospitals such as cancer detection
- Loan analysis and fraud detection in finance industry
- Cyber security
- Designing and manufacturing of products such as automobile

Q.16: Write any two steps of development of expert system?

Ans. Development of expert system includes the following steps.

- The expert system applies rules and reasoning to extract knowledge from the knowledge database and interpeets it to find the solution.
- Finally, the expert system will provide the solution to the end user.

Q.17: What is a Robot?

Ans. A robot is a mechanical or virtual artificial agent typically designed by humans to perform tasks automatically, with varying degrees of autonomy. Robots can be programmed to execute specific actions or behaviors, often utilizing sensors, actuators, and processors to interact with their environment and carry out tasks.

Q.18: How AI-based software is useful in healthcare sector?

Ans. AI-based software for healthcare:

1. Improves medical image analysis.
2. Offers clinical decision support.
3. Promotes drug discovery.
4. Enables personalized medicine.
5. Enables remote patient monitoring.

6. Improves healthcare procedures.

Q.19: What is the role of AI in Education?

Ans. AI based systems in education have many benefits for students, teachers and school/university administration. It enhances student's learning and helps teachers to carry out their tasks efficiently to provide quality education. AI based systems adapt to meet each student's individual learning needs. It helps teachers in grading students' assignments, examinations and essays.

Q.20: Describe AI in Agriculture?

Ans. AI in agriculture refers to using AI based modern techniques to help farmers produce high quality crops and increase production by using land more efficiently.

To solve the issue of food shortage and livestock in the future, it is important to use AI techniques and innovative farming ideas to increase production on existing farmland.

Q.21: What are the benefits of application of AI in agriculture?

Ans. The following are some benefits of application of AI in agriculture.

- AI is used for scanning images of insects that attack crops and livestock to detect and prevent spread of diseases.
- AI can help in monitoring and detecting health problems in livestock using drones, cameras and computer vision to avoid spread of disease.
- AI based drone technology is used for efficient spray of pesticide.

Q.22: How AI is helpful in our daily life?

Ans. AI improves our daily lives by providing personal assistants, enabling smart home devices, making online recommendations, facilitating language translation, personalizing social media, assisting with navigation.

Q.23: Describe the use of AI in business?

Ans. AI is used in business in the areas of e-commerce, marketing and business management. AI software is used to run the day-to-day business activities. It has many benefits in business.

Q.24: What is Chatbot?

Ans. A chatbot is a computer program that combines AI with natural language to provide instant answers to website visitor's questions through text or voice interaction. It mimics human conversation as a virtual assistant and automates responses to customers questions.

Q.25: What is Cloud Computing?

Ans. Cloud computing refers to delivery of computing services over the Internet by cloud computing vendors. These services include servers, storage, databases, networking software etc.

Q.26: Differentiate between Public and Private Cloud?

Ans. Public Cloud

In this cloud computing model, resources are owned and operated by a cloud service provider instead of being installed in-house on local devices.

Private Cloud

In this cloud computing model, resources are owned by and used inside a single organization. In other words, cloud computing is dedicated to a single organization.

Q.27: Define Hybrid Cloud.

Ans. Hybrid cloud is a combination of public private cloud. This computing model uses technology that allows data and applications to be shared between them.

Q.28: What is a major advantage of AI in surgeries?

Ans. One significant advantage of AI in surgery is its capacity to improve precision and accuracy, resulting in better surgical outcomes and a lower risk of complications.

Q.29: Why is transparency in AI decision making crucial?

Ans. Transparency in AI decision-making is critical for accountability, trust development, ethical considerations, bias identification, and mitigation.

Q.30: What are some key security measures taken by leading cloud providers to protect data in cloud computing?

Ans. To safeguard data in the cloud, leading cloud providers use important security features such as data encryption.

SOLVED EXERCISE

Multiple Choice Questions

Q1. Select the suitable answer for the following questions.

1. The process of taking known data set as input to train the algorithm to create a model for prediction is known as:
   (a) Natural Language Processing
   (b) Expert system
   (c) Supervised Machine Learning
   (d) Unsupervised Machine Learning
2. The AI technology that enables computer systems to obtain meaningful information from digital images videos is called:
   (a) Image recognition
   (b) Speech recognition
   (c) Scanner
   (d) Computer Vision
3. Instant answers to website visitors' questions through text or voice interaction are provided by:
   (a) Robot
   (b) Chatbot
   (c) Cloud computing
   (d) Expert system
4. Cloud computing model in which resources are owned by and used inside a single organization is called;
   (a) Private cloud
   (b) Public cloud
   (c) Hybrid cloud
   (d) Remote cloud
5. The AI tool used for correcting spelling and grammar mistakes is:
   (a) ChatGPT
   (b) Lovo ai
   (c) Grammarly
   (d) Virtual assistant
6. Virtual assistant that belong to Apple Inc. is:
   (a) Siri (b) Alexa
   (c) Google assistant (d) Cortana
7. The AI tool that converts text to speech is:
   (a) ChatGPT (b) Grammarly
   (c) Alexa (d) Lovo ai
8. The technology used in self-driving cars is called;:
   (a) Natural language processing
   (b) Chatbot
   (c) Computer vision
   (d) Virtual assistant
9. The technology concerned with training the computer to understand spoken and written words and to take action is known as:
   (a) Virtual Assistant
   (b) Natural language processing
   (c) Language analysis
   (d) Virtual training
10. The technology concerned with performing specific tasks with little or no human intervention using computer controlled machine is called:
    (a) Computer vision
    (b) Computer intelligence
    (c) Robotics
    (d) Virtual technology

ANSWERS

1	c	2	d	3	b	4	a	5	c
6	a	7	d	8	c	9	b	10	c

Short Questions Answers

Q.1 Briefly describe the positive impact of AI in our daily life.

Ans. Using AI technology, computer can be trained to perform various tasks by imitating

actions of human beings. It is the technology related with making intelligent machines and developing intelligent software.

Q.2 Differentiate between supervised and unsupervised machine learning.

Ans. Supervised learning algorithms take a set of known input data and known output responses to build a model to make predictions. In supervised learning the goal is to learn how to do the mapping to match the input to the output.

In unsupervised learning, the training data is unseen and it is un labelled. The meaning of un labelled is that the data is not assigned a category or group.

Q.3 Describe how computer visions applications help in automation of tasks.

Ans. AI computer vision gives ability to computer to see just like it gives ability to think. Computer vision applications are used in various fields. These include healthcare, security and surveillance, facial recognition, self-driving car, parking occupation detection, traffic flow analysis, manufacturing, construction, etc.

Q.4 Compare the use of Natural Language Processing (NLP) with computer languages for interaction with computer.

Ans. Comparison

Ease of Use: NLP enables non-technical users to interact intuitively with natural language. Computer languages necessitate specialized expertise and precise grammar.

Flexibility vs. Control: NLP allows for greater flexibility in human-computer interaction, with a focus on context and semantics. Computer languages provide fine control over program and system behavior.

Applications: NLP is commonly used for user-facing applications and communication, whereas computer languages are employed for software development and system-level tasks.

Q.5 What is robot? Mention four areas where robots can replace humans that are not mentioned in this unit.

Ans. . A robot is a machine that contains censors, cameras, microphone, control systems, etc. Designing of robot combines mechanical, electrical and structural engineering, mathematics, physics, etc.

Q.6 Is the used of Grammarly AI tool a perfect replacement of manual proofreading?

Ans. It is not a perfect tool as it has some inaccuracy issues. It does not catch every mistake and some suggestions it gives may not be correct. Since it is not 100% accurate, it is not a replacement .of manual proofreading.

Long Questions (Exercise)

Q.1 Relate how AI can be beneficial in education and business?

Ans. Education

AI based systems in education have many benefits for students, teachers and school/university administration. It enhances student's learning and helps teachers to carryout their tasks efficiently to provide quality education. AI based systems adapt to meet each student's individual learning needs. It helps teachers in grading students' assignments, examinations and essays.

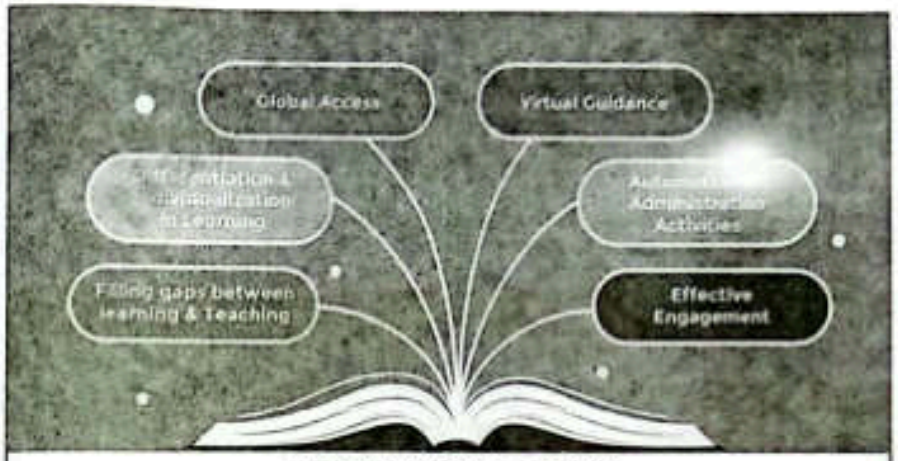


Fig. 5.11: Application of AI in education

Business

AI is used in business in the areas of e-commerce, marketing and business management. AI software is used to run the day-to-day business activities. It has many benefits in business. It helps people become efficient, improves productivity, and makes accurate decisions. Use of AI in business provides better services to customers, helps in business growth and generates more revenue. It helps in cybersecurity, smart pricing and automated recruitment as well. Fig. 5.15 shows application of AI in business.

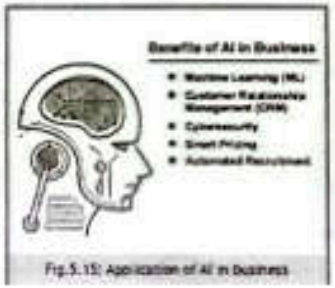


Fig.5.15: Application of AI in Business

Q.2 Articulate how AI-based technology can improve healthcare professionals and assist farmers increase crop production.

Ans. Healthcare

AI-based software is fed in various machines used in hospitals to help in diagnosis of certain diseases such as cancer. AI based microscope can scan harmful substances and bacteria in samples of blood, AI based patient monitoring systems in ICU help in measuring real-time data such as heart-beat, blood pressure, temperature, etc. that helps doctors in analyzing patient's health conditions. AI software provides personalized interaction between the patient and the hospital in managing health by reducing visits to the hospital.

Agriculture

AI in agriculture refers to using AI based modern techniques to help farmers produce high quality crops and increase production by using land more efficiently.

To solve the issue of food shortage and livestock in the future, it is important to use AI techniques and innovative farming ideas to increase production on existing farmland.

The following are some benefits of application of AI in agriculture.

Benefits of application of AI:

- AI is used for scanning images of insects that attack crops and livestock to detect and prevent spread of diseases.

- AI can help in monitoring and detecting health problems in livestock using drones, cameras and computer vision to avoid spread of disease.
- AI based drone technology is used for efficient spray of pesticide.
- AI based farming machinery such as drones, driverless tractors, smart spraying and fertilization systems are very helpful in increasing crop production.
- AI surveillance systems can help in providing security by not allowing unauthorized people and animals that can harm the crops, to enter the fields.

Fig. 5.13: Use of AI drone in agriculture

Q.3 Categorize the benefits of cloud computing? Contrast between public and private clouds.

Ans. Cloud computing enables business and organizations to access databases and cloud applications over the Internet from remote physical servers. It is an alternative to in-house data processing. The Internet becomes the cloud and users can access and process the data with any device that can connect to the Internet anywhere in the world.

There are three types of cloud computing, that is a pubic cloud, private cloud and hybrid cloud.

Public Cloud

In this cloud computing model, resources are owned and operated by a cloud service provider instead of being installed in-house on local devices. The resources that are delivered to businesses and organizations over the Internet include servers, software and storage. These resources are managed and maintained by the cloud service provider. Public cloud provides high speed connectivity to ensure rapid access to application and data.

Private Cloud

In this cloud computing model, resources are owned by and used inside a single organization. In other words, cloud computing is dedicated to a single organization. The user organization is responsible for the operation and maintenance of infrastructure (hardware, software, network, etc. Private cloud solution provides more control over servers and computer network.

Q.4 Compare between traditional algorithms and AI based algorithms that use machine learning. Criticize AI based algorithms for producing wrong results, at times.

Ans. Traditional algorithms and **AI-based algorithms** that employ machine learning (ML) offer distinct methods to computational problem solving. Here is a comparison and critique of AI-based algorithms, with a special emphasis on the problem of producing inaccurate results. Traditional algorithms are a set of explicit, deterministic rules or instructions meant to complete a certain task. These algorithms follow a set of stages to obtain a specific result.

Characteristics: They are often deterministic, which means they produce the same output when given the same input. The logic and flow of these algorithms are predetermined, and they operate within a predictable framework.

Applications: Traditional algorithms are utilized in cases where tasks are well-defined, with explicit rules and constraints, such as sorting, searching, and arithmetic operations and data processing.

Advantages: Predictable and repeatable results. Errors and problems can be detected and fixed since the reasoning is explicit and transparent. They're easier to test, debug, and maintain.

AI-based Algorithms and Machine Learning

Definition: AI-based algorithms that use machine learning create models that can learn from data and improve their performance over time without explicitly programming for every conceivable outcome.

Characteristics: These algorithms are adaptable and can detect patterns or links across vast datasets. They can use the data they are trained on to make predictions or choices.

AI-based algorithms are utilized in applications that require flexibility and adaptation, such as image identification, natural language processing, recommendation engines, and predictive analytics.

Advantages: Can deal with complex, non-linear relationships, adapt to new data, and increase performance over time. They can automate operations that would be difficult to program using traditional methods.

In conclusion, while AI-based algorithms are flexible and adaptable, they also present issues in terms of transparency, data quality, and ethical considerations. Traditional algorithms, in contrast, are more deterministic and transparent, but they may lack the flexibility and learning capabilities of AI-based approaches.

Q.5 Interpret the ethical issues in using the following AI tools:

a) Chat GPT

It is a very useful AI tool but it raises some ethical issues as well. Ethical issues include harm due to misinformation, cheating and plagiarism in schools and universities that can have negative impact on teaching / learning process and assessment of students' work. It also has issues such as bias, discrimination, data privacy and security.

b) Lovo AI

Lovo AI, a platform that provides text-to-speech and voice production services, has a wide range of applications, including accessibility solutions, marketing, and entertainment. However, like any technology with a wide range of applications, it raises ethical concerns that must be carefully considered. Here's an example of some of the ethical difficulties related to the AI capabilities given by Lovo AI:

- Deep-fakes and Voice Cloning
- Bias and Discrimination
- Intellectual Property and Ownership
- Transparency and Accountability

c) Virtual Assistants

Virtual Assistants (VAs), such as Siri, Alexa, and Google Assistant, have become indispensable in many people's everyday lives, bringing convenience and automation in a variety of chores. However, their use presents certain ethical concerns. Here's an instance of these concerns:

- Privacy and Data Security
- Consent and Transparency
- Bias and Discrimination
- Dependence and Dehumanization
- Ethical Design and Accountability
- Surveillance and Monitoring
- Commercialization and Consumerism

Activities

Activity 1

Create six groups of students and ask each group to find two applications of AI that are not mentioned in this unit. The leader of each group should explain it to the whole class.

Ans. Practical /Lab work or Class work.

Teacher's Guide

Suggested Group Breakdown:

Group 1: Explore AI applications in **Entertainment and Media**. AI-generated content (music, art, literature, etc.)

Content recommendation systems for streaming platforms

Group 2: Investigate AI's role in **environmental monitoring.** Consider applications like AI for wildlife conservation or climate change analysis.

Group 3: Look into AI applications in **creative industries.** This could include AI in music composition or AI-generated art.

Group 4: Examine AI in **sports and athletics.** This might involve AI for athlete performance analysis or AI-based virtual coaching.

Group 5: Research AI in the **legal sector.** Consider AI for contract analysis or AI-driven legal research.

Group 6: Consider AI in the **Manufacturing and Industry.** Predictive maintenance and equipment monitoring. Robotics and automation in manufacturing processes

Activity 2

Create eight groups of students and ask each group to download a video from internet on one of the following topics and play it on the projector to demonstrate its application.

Applications of AI in

- Manufacturing using robot
- Hospital for healthcare
- Education
- Gaming
- Agriculture

- Self driving cars
- Business
- Defense

Ans. Practical /Lab work or Class work.

Activity 3

Create six groups of students and ask each group to explain the issues that may arise in the application of AI on one of the following areas.

- Speech recognition
- Robotics
- Healthcare
- Self driving cars
- Chat GPT
- Grammarly

Ans. Practical /Lab work or Class work.

UNIT 06

IMPACTS OF COMPUTING

Long Questions

Q.1: What are the fundamental principles behind safe and responsible computer use?

Ans. An essential component of our contemporary digital world is the safe and ethical use of computers. Computers now play a crucial role in every aspect of our life, from personal to professional uses and their influence on society is evident. However, it is imperative to stress the significance of using computers safely and responsibly given their great power and connectivity.

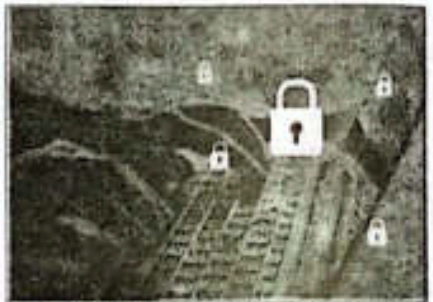


Fig. Safe and Responsible Use of Computer

The main focus of computer safety is safeguarding a computer systems hardware and software components.

Keep your system Updated

Consistently update the computer operating system, software and antivirus software. Important security areas that assist protect the computer system from flaws are frequently included in updates. Computer can be protected against malware with security software. Maintain the most recent virus definitions in the security program.

Use strong and Unique Password

For all online accounts, create strong, one-of-a-kind passwords. A mix of letters-both capital and lower case numbers and special characters make up a good password. Do not use data that can be easily guessed, such as names or birthdays. Turn on two – factor authentication for all of your online accounts.

Never reveal your passwords to anyone; keep them private and secure.

Beware of phishing Attacks

Receive emails, messages or pop-ups asking for your personal info or login details, be careful. Sometimes, scanners pretend to be official and try to trick you. Don't click on weird links and check if the sender's email address looks right . To protect your computer from viruses and bad software, use good antivirus software. Keep it updated and do regular scans.

Did You Know?

Phishing attacks date back to the mid-1990s, initially targeting AOL users through deceptive emails to steal login credentials, and have since evolved to exploit various digital platforms and sophisticated tactics.

Use Secure Wi-Fi Connection

Use strong passwords for protected Wi-Fi Networks when accessing the internet. Avoid using public Wi-Fi networks for private tasks like online banking since they are more susceptible to hackers.

Be careful what you Download

Download apps, programs and files only from reliable websites. Downloading files from untrusted websites should be avoided as they can include viruses or malware. Be especially careful about opening attachments in emails from people you do not know.

Privacy Settings

Review and adjust privacy setting on your computer social media accounts, apps and devices. Limit the amount of personal information you share publicly.

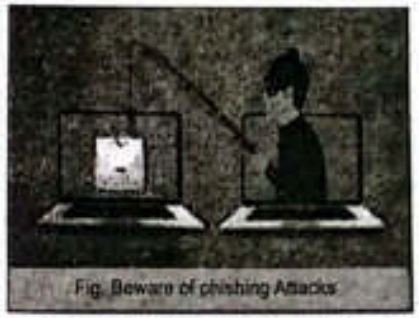


Fig. Beware of phishing Attacks

Be Mindful of Public Wi-Fi

Public Wi-Fi networks may not be as secure, leaving your data open to interception. When using public Wi-Fi, avoid accessing private data or doing financial activities online.

If necessary, encrypt the Wi-Fi connection using a virtual private network (VPN).

Practice Safe online Shopping and Banking

Only use secure websites with URLs beginning with https:// and a padlock symbol when making purchases or sending money online. Take care not to divulge unneeded personal details.

Q.2: Explain the use of Hardware and Software. OR

How does software interact with hardware to perform various tasks and operations?

Ans. It is important to address security, efficiency, sustainability, and ethical considerations when using physical computer equipment. In our technologically advanced society, responsible hardware use has grown more crucial whether it comes to smaller, more personal devices like smart phones or laptops or larger systems like servers and industrial machinery.

Responsible Hardware Use

This refers to the use of physical computer devices in a way that prioritizes security, sustainability, effectiveness and ethical issues. A through discussion of prudent hardware use is provided below.

Fig. Responsible hardware use

Extended Lifespan of Hardware

An ethical to lessen technological waste is to extend the life devices. This can be achieved by giving gadgets the correct care, preventing harm and keeping them free of wreckages and dust.

Data Security and Privacy

Safeguarding sensitive data requires the use of encryption, strong passwords, and two-factor authentication. To address security flaws that could be used by malicious actors, software and firmware updates must be conducted on a regular basis. This safeguards not just your personal information but also stops hardware from being utilized in hacks.

Sensible Upgrades

When improving your computer or other electronic devices, it is important to be responsible. Ask yourself if the upgrade is really needed and think about how it might affect the environment. Do not upgrade just because there is a new version available –doing that can create more waste.

Ethics in Hardware Use

Ethical issues are included in responsible hardware use. This entails abstaining from donating, paying attention to intellectual property rights and not using hardware for illegal activities. Use only authorized software and hardware.

Appropriate and Responsible use of Software

Responsible use of software is essential to ensure that technology benefits individuals and society while minimizing harm. Responsible software use requires a combination of legal compliance, ethical considerations and awareness of the broader societal impact of technology.

Observing the Law

Always abide by all applicable legal requirements, including copyright and intellectual property laws, when using software. Respect software licenses and follow their guidelines. Using software not in a way that violates copyright or other intellectual property laws.

Ethical Use

Avoid using software for unethical or malicious purposes, such as hacking, spreading malware or engaging in cyberbullying.

Privacy and Data Protection

When using software, be mindful of others and your own privacy. Pay attention to the personal information share and how it is used. Software privacy settings should be familiarized and set up according to the preferences.

Intellectual Property

Respect intellectual property rights when using or developing software, including patents, trademarks and copyrights. Give due recognition to those who created and contributed to open-source software.

Proper Listening

Be aware of the software's licensing terms and obey them. This includes understanding open-source licenses, commercial licenses and their requirements.

User Education

Inform yourself and others about using software responsibly, including ethical issues, digital literacy and the best practices for cybersecurity. Inform the proper authorities or service providers of any unauthorized use of software online platforms.

Q.3: Safe use of Digital Platform. OR

How can users identify and avoid potential scams or fraudulent activities on digital platforms?

Ans. Safe use of digital platforms is vital in today's interconnected world. Whether you are using social media, online banking, email, or any other digital service, it is important to follow best practices to protect your personal information and privacy.

By following safety guidelines, you can significantly enhance your online safety and minimize the risks associated with using digital platforms.

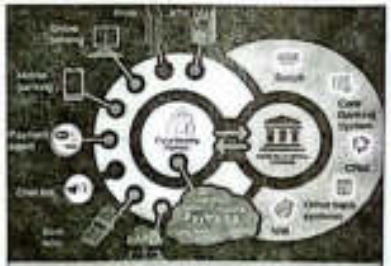


Fig. Safe use of digital platform

Safe use of Data Searches

Using digital platforms for data searches can be a valuable tool, but it is important to prioritize safety

and privacy. Stick to well known and trusted platforms for your data searches. Popular search engines like Google, Bing and data repositories like government websites or academic databases are usually safe choices.

Safe use of Social Networking

Safe use of digital platforms like social networking is essential to protect your personal information, privacy and overall online security. Social media can be a great way to connect and share, it is important to use these platforms responsibly and safely to protect your personal information and privacy.

Q.4: What are the key principles underlying laws that protect user privacy and intellectual property rights?

Ans. In the digital age, where private information and original work are shared and kept online progressively, rules protecting user privacy and intellectual property are crucial. In order to protect people's right and promote a just and progressive society, these laws are essential.

Protection of Individual Rights

User Privacy: In an age when personal data is widely gathered and processed, preserving user privacy is crucial to defending individual rights. Laws make certain that people are in charge of their personal data and have control over how it is used.

Intellectual Property

The rights to intellectual property safeguard the works of authors, artists and organizations, including inventions. Without these restrictions, inventors and creators might not feel compelled to devote the necessary time and resources to their work, thereby restricting their ability to innovate.

Prevention of Unauthorized Use

User privacy: Laws that protect user privacy help to prevent unlawful access to and use of personal information. This is essential to stop identity theft, fraud and other types of cybercrime that could hurt people.

Intellectual Property: Without intellectual property laws, there would be little incentive for businesses and individuals to invest in developing new technologies, products, or content. Protecting intellectual property ensures that creators and innovators can benefit from their work and encourages further innovation.

Computer Related Laws

There are several computer-related laws that govern various aspects digital activities and technology. It is important to note that laws can vary by country and new regulations may have been passed. Here are some common computer-related laws that exist in various jurisdiction.

Computer Fraud and Abuse Act (CFAA)

This law addresses unauthorized access to computer systems and data, as well as activities related to computer fraud and abuse.

General Data Protection Regulation (GDPR)

GDPR regulates the processing of personal data and provides individuals with greater control over their personal information. It applies to organizations operating within the EU and those processing the data of European Union citizens.

Digital Millennium Copyright Act (DMCA)

DMCA addresses copyright infringement issues related to digital content and provides a framework for dealing with copyright protection in the online environment.

Electronic Communications Privacy Act (ECPA)

ECPA sets the legal framework for the interception of electronic communications and unauthorized access to stored electronic communications.

Telecommunications (Interception and Access) Act

This law addresses the interception of telecommunications and access to communications data in Australia.

PIPEDA regulates the collection, use and disclosure of personal information by private-sector organizations in Canada

Computer Crimes Act (Various Countries)

Many countries have enacted laws specially addressing computer crimes, encompassing offenses such as unauthorized access, data interference and system interference.

Children's Online Privacy Protection Act (COPPA)

COPPA regulates the online collection of personal information from children under the age of 13.

Cybersecurity Law

China has enacted a comprehensive cybersecurity law to regulate various aspects of cyberspace activities, including data protection and critical information infrastructure security.

Q.5: What is computing innovation? Discuss its Benefits. OR
How do you define computing innovation, and what are some examples of recent advancements in this field?

Ans. Computing innovation means creating and using new or better computer stuff like processes, technologies, systems, and software. This can really change how society does things and how people live.


Fig. Software Development

Hardware Advancements

Innovation in computer often begins with the development of new hardware components and systems. This includes the creation of faster and more energy-efficient processors, high-capacity storage devices, and cutting-edge networking technologies.

Software Development

Computing innovation also heavily relies on the creation of innovative software solutions. This ranges from operating systems and productivity artificial intelligence (AI), machine learning, data analytics and more. Software innovations often lead to enhanced user experiences and improved efficiency.

Emerging Technologies

Revolutions in areas like artificial intelligence, blockchain, quantum computing , virtual reality (VR) and the internet of things (IOT) are constantly pushing the boundaries of what is possible in computer. These emerging technologies open up new avenues for entirely new applications and industries.

Human – Computer Interaction (HCI)

Innovations in HCI focus on improving the ways humans interact with computers and digital systems. This includes advancements in user interfaces, accessibility features and the integration of natural language processing and gesture recognition into everyday computing.

Benefits of Computing Innovation

Nearly every element of our life has been profoundly and significantly impacted by technological advancements. Here are a few positive outcomes of computer innovation:

Increased Productivity

The ability to automate many operations because to advancements in computing has enhanced efficiency in corporations and organizations. For instance, today's manufactures use robots to carry

out hazardous repetitive activities, while software is used to automate accounting and other administrative work.

Improved Communication

The development of the internet and related technologies has completely changed how people communicate. Through email, social media, video calls and other internet platforms, we may now interact quickly with individuals anywhere in the world.

Information Access

The internet provides easy access to a vast amount of information. This has empowered individuals to educate themselves, stay informed and conduct research more effectively.

Medical Advancements

Computing innovations have greatly advanced the field of medicine. From medical imaging to drug discovery, computers have accelerated research and improved patient care

Transportation

Innovations in computing have led to the development of autonomous vehicles, which have the potential to make transportation safer and more efficient.

Entertainment

Computer advances have completely changed the gaming and entertainment industries. The entertainment experience has been improved through high-quality graphics, virtual reality and interactive narrative.

Education

Education has been transformed by computers and the internet. Education is now more readily available to people all around the world thanks to online courses and E-learning platforms. Education may now be delivered more effectively and efficiently thanks to advances in computing.

Q.6: Describe harmful effects of computing innovation.

Ans. While computing innovation has brought about numerous benefits to society, it has also been important to recognize that these harmful effects are often the result of how technology is used rather than inherent flaws in computing itself. Here are some of the harmful effects of computing innovation:


Fig. Harmful effects of computing

Privacy Concerns

Computing innovation has led to the collection and analysis of vast amounts of personal data, often without individuals informed consent. This has raised serious concerns about privacy, data breaches and the potential for misuse of personal information.

Digital Addiction

The widespread use of smartphones, social media and online entertainment has led to concerns about digital addiction and its impact on mental health. Excessive screen time and constant connectivity can lead to anxiety, depression and social isolation.

Environmental impact

The production and use of computing devices has a significant environmental impact, including emission of greenhouse gases and the production of electronic waste.

It is important to be aware of the potential harmful effects of computing innovations so that we can use them in a responsible way.

Q.7: Can you define malicious software (malware) and explain its primary objectives and characteristics? OR
What are the Malicious software and key concepts?

Ans. Malware

Malicious software designed to harm or exploit computers or networks are called malware. Example of malwares are computer virus, ransomware or Trojan horse.

Phishing

Attempting to trick individuals into revealing sensitive information, often through fake emails or websites are called phishing. Example: A fraudulent email claiming to be from a bank, asking for login credentials.

Hacking

Unauthorized access or manipulation of computer systems or networks is called hacking. Example: A person gaining unauthorized access to a company's database to steal information.

Did You Know?

Mozilla, VLC Media Player, Audacity, GIMP & LibreOffice are Freeware Softwares.

Spam

Unsolicited and often irrelevant or inappropriate messages sent over the internet, typically via email is called a spam. Example of spam is unwanted promotional emails or messages.

Spyware

Software that secretly collects user information without their knowledge or consent is called a software. Example spyware is software tracking your online activities and sending the data to advertisers.

Pharming

Redirecting website traffic to a fake site without the user's knowledge is called pharming. Example of users intending to visit a legitimate banking site are redirected to a fraudulent site.

Cookies

Small text files stored on a user's device, containing information about their interactions with a website is called cookies. Example of cookies is saving login information or preferences on a website for a more personalized user experience.

Scams

Deceptive schemes designed to trick people for financial gain or personal information is called scam. Example of scam is email claiming you have won a lottery but asking for your back details to transfer the prize.

Software Piracy

Unauthorized copying, distribution, or use of software without proper licensing is called software piracy. Example of software piracy is downloading a cracked version of a paid software instead of purchasing it.

Fig. Freeware and shareware

Freeware

Software that is free to use without any payment is called freeware. Example of freeware is Mozilla Firefox, a free web browser.

Shareware

Software distributed on a trial basis with the option to purchase for full functionality is called shareware. Example of shareware is WinRAR, a file compression tool with a free trial period.

Open Source

Software with a publicly accessible source code that anyone can view, modify, and distribute is called open source. Example of open-source software is Linux operating system.

Q.8: What are the definitions of the terms provided, and how are they commonly used in their respective contexts?

- **Information privacy**
- **System security**
- **Usability trade-offs**

Ans. Information Privacy

Keeping personal information safe and not letting unauthorized people access it is called information privacy.

Tradeoff

To enhance privacy, you may need stricter controls and restrictions on accessing and sharing information. Example: Using complex passwords or encryption to protect your data.

System Security

System security refers to the measures and mechanisms implemented to protect computer systems, networks and data from unauthorized access, attacks, damage or theft. The primary goal of system security is to ensure the confidentiality, integrity and availability of information and resources. Firewall, encryption, antivirus software and access control are examples of system security.

Disinformation and Fake News

Disinformation and fake news are two terms that are often used interchangeably, but they have distinct meanings. Disinformation is false or misleading information that is deliberately spread to deceive people. Fake news is false or misleading information that is created to deceive people, but it is not necessarily done with the intention of harming them.

Fig. Disinformation and Fake News

Social Networking

Social networking refers to the practice of using online platforms and websites to connect with other people, build relationships, share information and engage in various forms of communication and interaction. These platforms are designed to facilitate the exchange of ideas, interests and personal updates among users.

Social Networking Harmful effects

Social networking platforms have become an integral part of modern life, providing opportunities for communication, information sharing and entertainment. However, they also have harmful effects on individuals and society.

Social Networking and Fake News

Social networking platforms have played a significant role in the spread of fake news and misinformation in recent years. Fake news refers to false or misleading information presented as factual news. Social networking platforms make it incredibly easy for users to share information with their networks.

Q.9: What are the Approaches to computing effects? Discuss in details:

Ans. Computing has had a deep impact on personal, ethical social, economic and cultural practices.

Personal Impact

Computing has made life more convenient with personal computers, smartphones and wearable devices, allowing individuals to manage their daily tasks, communication, and entertainment more efficiently.

Fig. Personal impact

Ethical Impact

Because businesses and government now gather and analyze personal data, there are more worries about data privacy and monitoring. The ethical use of cybersecurity measures to protect personal information as well as hacking, data breaches, and other related issues are raised.

Social Impact

Computing has had a big impact on how we live and connect with others. Social media sites like Facebook, Twitter, Instagram and LinkedIn have changed the way we communicate and share information. Apps like WhatsApp, WeChat and Telegram have made communication quick and easy, both in personal and professional settings.

Economic Impact

Computing has had a deep impact on economic practices over the past few decade. This impact can be seen in various aspects of the economy, including productivity, innovation, job creation and overall economic growth. Here are some the key ways in which computing has influence economic practices.

Cultural Impact

Computing has profoundly influenced culture in various ways. One significant impact is the way we communicate and connect with others. The rise of social media platforms and instant messaging has transformed how we share information and maintain relationships.

Impact on Globalization

Computing has had a profound impact on globalization, transforming the way people, businesses and countries interact and conduct their affairs on a global scale Computing technologies, especially the internet, have revolutionized communication.

Impact on E-commerce

Business now have more ways than ever to connect with clients around the world thanks to the growth of e-commerce platforms and online marketplaces. The ability to sell goods and services abroad has enabled businesses and consumers now have quick access to a wide range of international products.

Q.10: What are the key terms of intellectual property protection? Briefly describe.

Ans. Intellectual property protection involves safeguarding creations of the mind, such as inventions, designs and artistic works, through key terms like patents (for inventions), copyrights (for original works) and trademarks (for distinctive symbols identifying products or services).

Patents

A patent is a legal document that grants its holder the exclusive right to make, use, and sell an invention for a specified period, usually 20 years. Example of patent is if someone invents a new and useful gadget, they can apply for a patent to protect their invention from being made or sold by others without permission.

Trademarks

A trademark is a recognizable sign, design, or expression that distinguishes products or services of a particular source from those of others. Example is the apple logo is a trademark that identifies products like iPhones and MacBooks. Trade marks help consumers associate a particular quality or reputation with the goods or services.

Copyrights

Copyrights is a legal right that grants the creator of an original work exclusive rights to its use and distribution, usually for a limited time, with the intention of enabling the creator to receive compensation for their intellectual investment. An author who writes a book automatically holds the copyright to that work. This means others cannot reproduce, distribute or perform the work without the author's permission.

Did You Know?

Copyright originated in England with the Statute of Anne, enacted in 1710.

Multiple Choice Questions

1. Which practice is essential for responsible software use?
   (a) Sharing licenses
   (b) Regular updates
   (c) Ignoring updates
   (d) Using pirated versions
2. Why use hardware responsibly?
   (a) Reduce satisfaction
   (b) Minimize costs
   (c) Increase replacements
   (d) Improve appearance
3. What violates responsible software use?
   (a) Installing updates
   (b) Sharing licensed copies
   (c) Regular backups
   (d) Following EULA
4. Why follow hardware maintenance guidelines?
   (a) Voids warranty
   (b) Reduces efficiency
   (c) Ensures performance
   (d) Leads to obsolescence
5. What supports responsible use of hardware and software?
   (a) Ignoring maintenance
   (b) Using outdated software
   (c) Strong security measures
   (d) Improper disposal
6. What enhances online security?
   (a) Simple passwords
   (b) Two-factor authentication
   (c) Sharing passwords
   (d) Ignoring updates
7. How should personal information be handled online?
   (a) Share freely
   (b) Post publicly
   (c) Keep private
   (d) Use weak passwords
8. What is a safe practice on social media?
   (a) Accept all friend requests
   (b) Share location always
   (c) Adjust privacy settings
   (d) Post sensitive data
9. What should be avoided in emails?
   (a) Opening attachments from unknown sources
   (b) Using respectful language
   (c) Organizing inbox
   (d) Using subject lines
10. Which practice helps protect devices?
    (a) Ignoring antivirus software

(b) Using outdated software
(c) Installing updates
(d) Disabling firewalls

11. Which technology is essential for AI?
(a) Spreadsheets
(b) Machine learning
(c) Word processing
(d) Graphic design

12. What is a key feature of cloud computing?
(a) Local storage
(b) Remote access
(c) Manual backups
(d) Standalone operation

13. Which innovation allows virtual meetings?
(a) Text editors
(b) Video conferencing
(c) Spreadsheet software
(d) Presentation tools

14. What does IoT stand for?
(a) Internet of Things
(b) Internal operating Technology
(c) Input-output Transfer
(d) Integrated Optical Technology

15. What is the benefit of blockchain?
(a) Centralized control
(b) Secure transactions
(c) Slow processing
(d) Manual verification

ANSWERS

1.	b	2.	b	3.	b	4.	c	5.	c	6.	b	7.	c
8.	c	9.	a	10.	c	11.	b	12.	b	13.	b	14.	a
15.	b												

Short Questions Answers

Q.1: Differentiate between software and hardware?

Ans. Hardware refers to the physical components of a computer system, such as the CPU, RAM, hard drives, and peripherals like the keyboard and monitor. These are tangible and can be touched and seen. Hardware executes the instructions provided by software, making it possible for tasks to be performed. **Software** consists of the programs and applications that run on the hardware, including operating systems, word processors, and games. It is intangible and provides the necessary instructions for hardware to perform specific tasks.

Q.2: Describe some points which can guide the precautionary measures of the use of software.

Ans.

- Have strict rules for how you get, use, and update software, like apps for phones.
- Always use legal software and make sure you have enough permission for all the computers using it. Check this regularly if your business is getting fit, don't force it. Ask for help.

Q.3: Describe some points which can guide the precautionary measurement of the use of Digital Platform.

Ans.

- Think before you share online. Ask yourself if what you're posting is okay for everyone to see. Be careful about sharing personal information or where you are because if might not be safe.
- Stop location sharing on social media. You don't always need to tell people where you are. Check your privacy settings to make sure your location isn't shared without your permission.
- Use a safe internet connection. Avoid using public Wi-fi for sites with passwords. Stick to your private Wi-Fi or use your phone's data or a VPN.

Q.4: What is Digital Platform?

Ans. A digital platform is an online framework that enables users to interact, share information, and conduct transactions. It typically consists of software and services that facilitate communication, content distribution, and commerce. Examples include social media

networks like Facebook, e-commerce sites like Amazon, and collaboration tools like Slack.

Q.5: Describe the importance of Privacy Acts?

Ans. Privacy laws are critical for safeguarding individuals' personal information against illegal access, use, or disclosure. They provide legal frameworks to protect data privacy and security, building confidence between the public and organizations. Privacy laws serve to prevent identity theft, financial fraud, and the exploitation of personal information.

Q.6: What are the important Privacy Acts?

Ans. Here is the list of privacy Acts:

- The 1980 Privacy Protection Act
- The 1984 Cable Communications Policy Act
- The 1987 Computer Security Act
- The 1988 Video Privacy Protection Act
- The Computer Misuse Act 1990
- The 1998 Data Protection Act

Q.7: Describe the Ethics of data.

Ans. Data ethics refers to the concepts and norms that govern the proper gathering, use, and management of data. Key components of data ethics are:

1. **Privacy:** Protecting personal information and giving individuals control over how their data is used.
2. **Transparency:** Being upfront about data collection techniques, aims, and how data will be used, ensuring user information and consent are received.
3. **Security**: Enforcing strong safeguards to protect data from unauthorized access, breaches, and cyber threats.

Q.8: What do you know about Copyright?

Ans. Copyright is a legal notion that grants artists exclusive rights to their unique works, including literary, artistic, and musical works. It grants creators the right to control the reproduction, distribution, and public performance of their works. Copyright protection is automatically applied to qualifying works upon creation, allowing artists to enforce their rights against unlawful usage.

Q.9: How has computing influenced social interactions?

Ans. Computing has greatly influenced social connections by allowing for rapid communication via social media, messaging apps, and video conferencing. It promotes worldwide connections and collaboration while raising worries about privacy, cybersecurity, and the influence on face-to-face social skills.

Q.10: What are the negative societal implications of computing?

Ans. The negative societal effects of computing include employment displacement owing to automation, digital addiction, and privacy problems. The digital divide exacerbates inequities, and cybercrime and misinformation endanger people and society as a whole.

Q.11: What is Patent?

Ans. A patent is a legal privilege granted to inventors by a government authority that gives them exclusive ownership and control over their creation. It grants inventors the right to restrict others from creating, using, selling, or distributing their invention without their permission for a set length of time, often 20 years after the filing date.

Q.12: Describe the use of Trademark sign?

Ans. The trademark symbol (™) indicates that a certain word, phrase, symbol, or logo is being claimed as a trademark or service mark. It communicates to others that the owner of the mark claims rights to its use in connection with specified goods or services.

Q.13: What are the trade secrets?

Ans. Trade secrets are like a business special secrets. They're private things like methods, formulas, or strategies that give a business an edge over others. They're not for anyone else to use without permission and help a business stay ahead.

Q.14: How has computing affected healthcare?

Ans. Computing has transformed healthcare by enabling Electronic Health Records (EHRs),

telemedicine, and cutting-edge diagnostic technologies. It enhances patient care by improving data management and facilitating research through big data analytics, resulting in more effective therapies and tailored medicine.

Q.15: What's the environmental impact of computing?

Ans. Computing has substantial environmental implications, including energy usage and electronic trash. Data centers consume large quantities of electricity, which contributes to carbon emissions, while poor e-waste disposal causes pollution and health risks owing to dangerous elements such as lead and mercury.

Q.16: How has computing impacted Education?

Ans. Computing has altered education by allowing for online learning platforms, digital classrooms, and access to large resources and interactive technologies. It enables more individualized learning experiences, better cooperation between students and teachers, and wider global access to education.

Q.17: How does computing impact modern company operations?

Ans. Computing plays an important part in modern company since it automates operations, improves data analysis, and facilitates communication. It enhances efficiency and decision-making with technologies including as CRM systems, cloud computing, and AI-powered insights, resulting in greater productivity and creativity.

Solved Exercise

Multiple Choice Questions

1. What does responsible use of hardware entail?
   (a) Using outdated software
   (b) Treating computer equipment with care and respect
   (c) Ignoring software updates
   (d) Sharing passwords with friends
2. Which of the following is an example of appropriate use of software?
   (a) Downloading and using cracked software
   (b) Regularly updating software to the latest version
   (c) Sharing software licenses with multiple users
   (d) Disabling antivirus software for faster performance
3. Safe use of digital platforms includes:
   (a) Sharing personal formation with anyone online
   (b) Using strong, unique passwords for each online account
   (c) Downloading files from unknown sources without scanning for malware
   (d) Accepting friend requests from strangers without verifying their identify
4. Which of the following is an example of inappropriate-software use?
   (a) using licensed software for personal projects
   (b) Respecting software copyrights and licenses
   (c) Modifying software code without permission from the developer
   (d) Updating software regularly to improve its performance
5. Which of the following is a potential harmful effect of social networking?
   (a) Promoting social awareness and activism
   (b) Facilitating cyberbullying and harassment
   (c) Fostering offline community engagement
   (d) Enhancing critical thinking skills
6. How can fake news be harmful in the context of computing innovations?
   (a) It encourages fact-checking and critical thinking
   (b) It can manipulate public opinion and spread misinformation
   (c) It fosters trust in credible news sources
   (d) It has no impact on society
7. In what way can social networking platforms positively impact businesses and entrepreneurs?
   (a) By decreasing the reach and visibility of business
   (b) By limiting customer engagement and feedback
   (c) By providing a platform for marketing, customer engagement and networking
   (d) By increasing operational costs and inefficiencies
8. What is one potential beneficial effect of social networking platforms?
   (a) Enhanced personal privacy
   (b) Improved offline communication skills
   (c) Increased connectivity and networking opportunity
   (d) Reduced exposure to diverse viewpoints
9. What is an ethical concern related to computing?
   (a) Increased accessibility to information
   (b) Enhanced cybersecurity measures
   (c) Privacy breaches and data misuse
   (d) Improved healthcare through telemedicine
10. What is a cultural impact of computing?
    (a) Preservation of traditional cultural practices and customs
    (b) Homogenization of global culture with a single dominant culture
    (c) Elimination of the need for cultural preservation efforts
    (d) reduced cultural diversity and innovation
11. How does computing contribute to economic practices?
    (a) It increases manual labor jobs
    (b) It has no impact on job markets
    (c) It automates tasks, leading to job displacement but also creating new job opportunities
    (d) it primarily benefits large corporations, neglecting small businesses.
12. Which of the following is a personal benefit of computing in healthcare?
    (a) Reduced access to medical information
    (b) Increased medical errors
    (c) Improved telemedicine and healthcare accessibility
    (d) Lower healthcare costs

ANSWERS

1	b	2	b	3	b	4	c	5	b	6	b	7	c
8	c	9	c	10	a	11	c	12	c				

Short Answers Questions

Q.1: Illustrate the responsible use of computer hardware by an individual.

Ans: Individuals who utilize computer hardware responsibly should update and maintain the equipment on a regular basis to ensure optimal performance and longevity. This includes cleaning the hardware to prevent dust buildup, utilizing surge protectors to safeguard against electrical damage, and providing adequate airflow to prevent overheating.

Q.2: What does appropriate software use entail?

Ans: Appropriate software use entails installing and using software lawfully, with all applications bought from trusted sources to

avoid viruses. Users should update software on a regular basis to protect against vulnerabilities, adhere to licensing agreements, and keep backups to avoid data loss.

Q.3: How do you stay safe while conducting data searches online?

Ans: To keep safe while searching for info online, utilize trustworthy search engines and websites, and avoid clicking on questionable links or advertisements. To protect yourself from infection, enable security measures such as HTTPS and keep your antivirus software up to date.

Q.4: Extract and enlist some key aspects of responsible social networking.

Ans: Protecting personal information by altering privacy settings, being attentive of posted content to avoid oversharing, and respecting the privacy and opinions of others are all important parts of responsible social networking. It also includes avoiding cyberbullying, reporting improper content.

Q.5: Sketch the positive impacts of social networking in today's society.

Ans: Social networking benefits society by promoting worldwide communication and connection, allowing people to maintain contact with friends and family. It promotes community building and collaboration by offering forums for advocacy and social movements.

Q.6: Relate fake news affecting our understanding of current events.

Ans: Fake news alters our perception of current events by disseminating misinformation and misleading narratives, causing confusion and uninformed attitudes. It erodes trust in reputable news sources and polarizes public discourse, frequently causing conflict and division. Misinformation can influence political decisions, public health responses.

Q.7: Summarize some of the adverse effects of social Networking.

Ans: Excessive use of social media can lead to addiction which can negatively impact mental well-being. Social media can facilitate cyberbulling, Harassment, Threatened and humiliation. Personal data can be misused or exposed in security breaches. Social media can spread false information rapidly, contributing to misinformation and conspiracy theories, which can have real-world consequences.

Q.8: Interpret the dangers associated with the spread of fake news online.

Ans: The rise of fake news online offers various risks, including a loss of public faith in media and institutions, as well as societal divisiveness caused by the reinforcement of prejudices and disinformation. It can cause poor decision-making, sway elections, and provoke violence or panic.

Q.9: Examine the computing influence on personal privacy.

Ans: Computing has a huge impact on personal privacy since it collects and stores large amounts of personal data through numerous gadgets and online activities. While this data can improve user experiences and services.

Q.10: Criticize about the role computing plays in shaping educational practices.

Ans: Computing has a transformative impact on educational processes, providing benefits such as personalized learning, access to large resources, and increased cooperation. However, it also creates new issues, such as the digital gap, in which unequal access to technology exacerbates educational disparities.

Long Questions (Exercise)

Q.1: Identify the precautions that need to be taken ensure the physical safety of computer hardware.

Ans: Ensuring the physical safety of computer hardware is critical for safeguarding sensitive data and maintaining operational continuity. Here are some important safeguards to follow.

Environmental Controls

Temperature and humidity: Maintain the ideal temperature and humidity conditions. Use air conditioning to avoid overheating, and dehumidifiers to reduce moisture, which can promote corrosion.

Dust Control: Keep the surroundings clean of dust. Use air filters and clean the area on a regular basis to avoid dust buildup, which can clog fans and vents and cause overheating.

Power Protection: Using high quality uninterruptible power supply (UPS) equipment can help protect your hardware against damage from unexpected power supply unclean power. By using anyother type of supply, make sure there is no interruption between your computer system and the main supply.

Surge Protectors: Use surge protectors to safeguard your hardware from voltage spikes. Uninterruptible Power Supply (UPS): Use UPS systems to supply backup power during outages and safeguard against power fluctuations.

Physical security : Security mark computer and other high-value items. Keep pointed photographic records of all equipments and lock them away safely.

Locks and Enclosures: Use locking mechanisms and secure enclosures to prevent unwanted entry and theft.

Security Cameras: Install surveillance cameras to monitor access to hardware areas.

Access Control Systems: Implement access control systems (e.g., keycards, biometric scanners) to restrict entry to server rooms and other critical areas.

Proper Handling and Transport

Anti-Static Precautions: Use anti-static wrist straps and mats when handling components to avoid electrostatic discharge (ESD) damage.

To avoid physical damage, carry hardware in padded boxes with secure packing materials.

Fire Safety

Install fire suppression systems, such as sprinklers or gas-powered systems suited for electronic equipment.

Smoke Detectors: Install and maintain smoke detectors in places where hardware is stored or utilized.

Redundancy and Backup

Redundant Systems: Implement redundant systems and backups for critical hardware to ensure continuity in case of hardware failure.

Offsite Backup Storage: Store backups offsite to protect against physical damage to the primary location.

Q.2: Judge the meaning of using software legally and ethically.

Ans: Using software lawfully entails conforming to the licensing agreements and terms established by the program developers. This includes not using pirated or illegal versions, obtaining software from genuine sources, and adhering to the given usage limits, such as the number of installations and users permitted. Regular audits should be performed to ensure compliance, and updates and patches should be installed to maintain security and functioning.

Ethically, utilizing software entails respecting developers' intellectual property rights and properly crediting open source or community-contributed software. This entails using the product only within the scope specified by its license, such as avoiding using personal licenses for commercial reasons or educational licenses outside of academic contexts. Protecting user data and privacy is critical, as is adhering to data protection legislation and maintaining transparent data management policies.

Ethical software use also includes supporting accessibility, ensuring that the software is usable by persons with impairments, and avoiding misleading methods such as spyware or unethical data collection. Encouraging fair access to software, particularly in educational and non-profit settings, is critical for creating a fair digital environment. Individuals and organizations that adhere to these legal and ethical norms help to create a trustworthy and responsible digital ecosystem.

Q.3: Express the ways, users can recognize and protect themselves from online cheats and phishing attempts.

Ans: Recognizing Online Cheats and Phishing Attempts

Suspicious Email and Messages

Be aware of emails from unfamiliar senders or addresses that appear strange or misspelled. Look for generic greetings like "Dear Customer" instead of your name. Be careful of messages that convey a sense of urgency or promise dire repercussions if quick action is not done.

Links and attachments

Hover over links to see the full URL before clicking. Phishing attempts frequently include false links. Do not open attachments from unfamiliar or unexpected sources, as they may contain malware.

Requests for Personal Information:

Be skeptical of unsolicited requests for personal or financial information. Legitimate organizations typically do not ask for sensitive information via email.

Protecting Against Online Cheats and Phishing Attempts

Email Security

Use and update spam filters to detect phishing attempts before they reach your mailbox. Enable two-factor authentication (2FA) on your email accounts to add an extra degree of security.

Web Security

Ensure that websites use HTTPS, particularly when entering sensitive information. Look for a padlock icon in your browser's address bar.

Avoid clicking on links in emails or communications that come from unknown sources.

Verify Requests

If you receive a suspicious request from a supposedly legitimate source, contact the organization directly using a known, trusted method to verify its authenticity.

Regular Monitoring

Regularly check your bank statements and online accounts for unauthorized transactions.

Monitor your credit reports for unusual activities.

Q.4: Comment on the key ways in which social networking platforms have revolutionized communication and connectivity in the digital age. Additionally, deduce the positive impacts of these changes on society.

Ans: Revolutionizing Communication & Connectivity.

Instant and Global Communication

Social networks provide real-time connection around the world, breaking down geographical barriers and making it simple to remain in touch with friends, family, and coworkers regardless of location.

Enhanced Information Sharing

Facebook, Twitter, and Instagram enable users to exchange updates, photographs, videos, and articles in real time, encouraging a culture of rapid information transmission.

Community Building

These platforms help users build communities based on shared interests, hobbies, or aspirations, allowing them to connect with others who share their enthusiasm.

Professional Networking

LinkedIn and other similar sites have transformed professional networking, making it simpler to connect with industry peers, find job possibilities, and share professional accomplishments.

Positive impacts on society include increased social awareness and activism.

Social networking sites have evolved into effective tools for increasing awareness about social, political, and environmental issues, mobilizing support for causes, and encouraging social activism.

Enhanced Connectivity and Support

These platforms foster relationships and provide support networks, particularly for people who are geographically separated or unable to connect in person.

Access to Information and Education

Users can access a wealth of information and educational resources, allowing them to learn for the rest of their lives and stay up to date on world events.

Culture Exchange and Diversity

Social networks encourage cultural exchange by exposing users to various cultures, perspectives, and ideas, resulting in a better knowledge and appreciation of variety.

In summary, social networking platforms have transformed the way we interact and connect, resulting in a more interconnected society.

Q.5: Describe the risks associated with online gaming and social networking for children.

Ans: Online gaming and social networking provide various benefits to children, including amusement, social connection, and educational opportunities; nevertheless, they also carry major risks that must be carefully managed.

Risk

One significant risk is exposure to improper information, such as violent, sexual, or otherwise inappropriate material, which youngsters may come across when playing games or surfing social media.

Cyberbullying

Cyberbullying is a common problem in online gaming and social media, where youngsters can be harassed, tormented, or humiliated by their peers. The fascinating aspect of online gaming can develop to addiction, resulting in excessive screen time that harms physical health, sleep patterns, and academic performance.

Online gaming

Online gaming and social networking provide youngsters a variety of benefits, including entertainment, social connection, and educational opportunities; nevertheless, they also pose significant risks that must be carefully addressed. One big risk is exposure to inappropriate information, such as violent, sexual, or otherwise inappropriate content, which children may encounter when playing games or browsing social media.

Misleading News

Misleading news and misinformation can mislead children and influence their opinions and ideas incorrectly. Finally, texting and controlling their digital imprint can have serious consequences, with shared photographs potentially broadcast beyond their control, harming their reputation in the long run.

Q.6: Devise steps for governments and businesses in leveraging computing to drive economic growth and innovation.

Ans: Governments and corporations can work together effectively to use computing technology to boost economic growth and stimulate innovation. Governments play an important role in providing the infrastructure, regulatory frameworks, and support systems that allow enterprises to prosper in the digital age.

Steps for Government

Firstly, investing in robust computing infrastructure, including high-speed internet connectivity and data centers, is crucial to help firms in embracing digital technologies and accessing global markets. Prioritizing such investments allows governments to establish the groundwork for a vibrant digital economy.

Second, governments can support digital literacy and skill development projects to guarantee that the workforce has the knowledge and ability to effectively use computing technologies.

Steps for Business

First

Governments can create training programs and educational initiatives that will enable citizens to prosper in a digital-first economy by collaborating with educational institutions and industry stakeholders.

Businesses, on the other hand, play an important role in promoting innovation and exploiting computing technologies to increase productivity and competitiveness.

Second, collaboration and partnerships are critical for accelerating innovation and creating new opportunities. Companies that collaborate with other businesses, startups.

Lastly, organizations must prioritize cybersecurity and risk management to secure their digital assets, consumer data, and intellectual property from cyber threats.

Q.7: Compare the impact of online platforms and algorithms on cultural diversity and the spread of global or local culture?

Ans: Online platforms and algorithms have a tremendous impact on cultural diversity and the spread of global or local culture.

Online Platforms:

Online platforms act as conduits for cultural exchange, providing access to a wide range of content from around the globe. They enhance cross-cultural encounters, allowing individuals to engage with other ideas, traditions, and languages. Furthermore, these platforms allow minority cultures and marginalized people to share their legacy, which helps to preserve and celebrate cultural variety. However, the algorithms used by online platforms can influence how people consume cultural content. They frequently promote popular or current content, potentially homogenizing cultural expression by promoting mainstream global culture over local or regional content.

Algorithms:

Algorithms may also contribute to the construction of filter bubbles and echo chambers, which limit exposure to varied perspectives and promote polarization. Despite these obstacles, online platforms enable the global spread of both global and local culture. They facilitate cultural fusion as users share and remix cultural components from diverse places, enabling a dynamic flow of ideas and traditions. Furthermore, localization capabilities enable information to be customized to unique cultural contexts, balancing the preservation of local traditions with global access.

Lab activities

Activity 1

A focus on Safe and Responsible Usage

The principles of "understanding and applying safe and responsible use of computers. "The session will be divided into three key components: responsible use or hardware, appropriate use of software, and safe navigation through digital platforms. Through interactive discussions, real-life scenarios, and hands-on exercises, participants will gain practical insights into the responsible handling of computer hardware, ensuring its longevity and optimal performance. The appropriate use of software will be explored, emphasizing ethical considerations and legal implications. Additionally, participants will learn how to safely navigate digital platforms, including connecting data searches and participating in social networking. By the end of the activity, participants will have acquired a comprehensive understanding of the ethical and secure practices crucial for a responsible and proficient use of computers in today's digital landscape.

Ans. Lab work / class work

Activity 2

Analyzing Benefits and Pitfalls of Computing innovations in a Classroom Setting

In this engaging activity, students will delve into the multifaceted realm of computing innovations by critically exampling the beneficial and harmful effects of key phenomena, including social networking and the proliferation of fake news. The activity begins with a brainstorming session, encouraging students to list potential positive impacts such as enhanced communication, information dissemination and connectivity, as well as negative consequences like privacy concerns, cyberbullying and the spread of misinformation. Following this, students will be divided into small groups to conduct in-depth research on specific examples or case studies related to social networking and fake news. Each group will then present their findings, facilitating a classroom-wide discussion to example the broader implications of these computing innovations. This activity not only promotes analytical thinking but also encourages students to reflect on ethical considerations surrounding technological advancements.

Ans. Lab work / class work

Activity 3

Understanding the impact of Computing on Human Life

In this engaging a activity, participants will delve into the multifaceted impact of computing on various aspects of human life. The session will commence with an exploration of how computing influences personal practices, ranging from daily routines to individual decision-making processes. Subsequently, participants will engage in discussions on the ethical implications of computing, contemplating issues such as privacy, security and digital rights. The activity will also delve into the social sphere, examining how computing technologies shape interpersonal relationships, communication patterns, and societal dynamic. Moving on to the economic realm, participants reflecting on how technology influences cultural practices, norms, and expressions. Through group discussions, case studies and reflective exercises, this activity aims to foster a comprehensive understanding of the intricate ways in which computing shapes our personal, ethical, social, economic and cultural landscapes.

Ans. Lab work / class work

UNIT 07

ENTREPRENEURSHIP

Long Questions

Q.1: Discuss the Concept of Entrepreneurship.

Ans. The process of creating an enterprise is called "entrepreneurship" it involves the propensity of mind to calculate risks with confidence to achieve a pre-determined business or industrial objectives.

It is a process undertaken by an individual which involves taking risks and making the necessary investments under conditions of uncertainty and innovating, planning and taking decisions as to increase production in agriculture, business and industry etc.

What is an Entrepreneur?

Entrepreneur is a person who starts or own business, organizes and manages it taking on financial risks for the sake of profit. He who shifts economic resources out of an area of lower and into the area of higher productivity and greater yield. The researchers have made much effort over the last few decades trying to paint a clear picture of "the entrepreneurial personality."

1. **Desire for responsibility:** Entrepreneur feel a deep sense of personal responsibility for the outcome of ventures they start. They prefer to be in control of their resources and they use those resources to achieve self-determined goals.
2. **Preference for Moderate Risk:** Entrepreneurs are not wild risk takers but are instead calculated risk takers.
3. **Self-Reliance:** Entrepreneurs must fill multiple roles to make their companies successful, especially in the early days of a start-up. Because their resources usually are limited, they end up perfoeming many jobs themselves, even those they know little about.
4. **Confidence in their ability to succeed:** Entreprencurs typically have an abundance of confidence in their ability to succeed and are confident that they chose the correct career path.
5. **Determination:** Some people call this characteristic "grit," the ability to focus intently on achieving a singular, long-term goal. Studies show that grit is a reliable predictor of achievement and success, whether the goal involves launching a successful business.

Did You Know?

An Entrepreneur must: Define a clear vision and mission statement for the business, outlining its purpose, values, and long-term goals.

6. **Desire for immediate feedback:** Entrepreneurs enjoy the challenge of running a business and they like to know how they are doing and are constantly looking for feedback. The feedback they receive from their businesses drives them to set higher standards of performance for their companies and themselves.
7. **High level of energy:** Entrepreneurs are more energetic than the average person. That energy may be a critical factor given the incredible effort required to launch a start-up company. Long hours and hard work are the rule rather than the exception, and the pace can be grueling.
8. **Future Orientation:** Entrepreneurs have a well-defined sense of searching for opportunities. They look ahead and are less concerned with what they did yesterday than with what they might do tomorrow. Not satisfied to sit back and revel in their success, real Entrepreneurs stay focused on the future.
9. **Skill at Organizing:** Building a company "from scratch" is much like piecing together a giant jigsaw puzzle. Entrepreneurs know how to put the right people together to accomplish a task. Effectively combining people and jobs enables entrepreneur to transform their visions into reality.

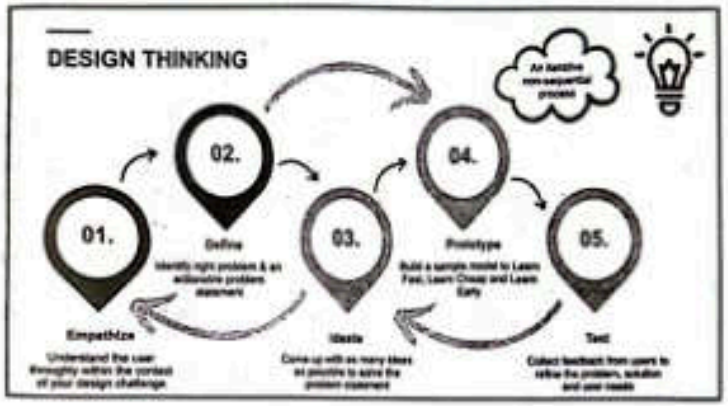
10. **Value of achievement over money:** One of the most common misconceptions about entrepreneur is that they are driven wholly by the desire to make money. To the contrary, achievement seems to be entrepreneurs primary motivating force; money is simply a way of "keeping score" of accomplishments a symbol of achievement.

Q.2: What is design thinking? OR Provide an overview of what constitutes design thinking.

Ans. Some of the world's leading brands, such as Apple, Google and Samsung, rapidly adopted the design thinking approach, and leading universities around the world teach the related methodology-including Stanford, Harvard, Imperial College London etc.

Design thinking is an iterative and non-linear process that contains five phases:

1. Empathize 2. Define 3. Ideate 4. Prototype 5. Test



Design Thinking is an iterative and non-linear process. This simply means that the design team continuously uses their results to review, question and improve their initial assumptions, understandings and results.

Developing a Business Plan

The primary goals of the business plan are to guide entrepreneurs as they launch their businesses and to help them acquire the necessary financing to launch. A business plan offers:

- A systematic, realistic evaluation of a venture's chances for success in the market.
- A way to determine the principal risks facing the venture.
- A "game plan" for managing the business successfully during its start-up.
- A tool for comparing actual results against targeted performance.
- An important tool for attracting capital in the challenging hunt for money.

In today's global competitive environment, any business, large or small, that is not thinking and acting strategically is extremely vulnerable. Every business is exposed to the forces of a rapidly changing competitive environment, and in the future small business executives can expect even greater change and uncertainty.

Business Plan Pro is Live Plan ideal for entrepreneurs who are writing their first business plan. This software comes pre-loaded with more than 500 business plan templates to help you get started on your own. If that's not enough, you also get step-by-step instructions for each section and explains the reasons for including it. You'll get straight-forward instructions with example on:

- Writing a pitch that grabs investors' attention
- What to include in your marketing plan

- Every essential piece of your business plan

Live Plan save lot of time because the software does so much of the work for you. All you have to do is answer questions and data.

Plan Maker is a spreadsheet program that is part of the Soft Maker Office suite. It is available on Microsoft Windows, MacOS, Linux and Android and iOS.

Plan Write gives you all the tools you need to create your business plan and present it to investors. Start with one of their hundreds of examples and then use their built-in wizard to guide you through the process of customizing the plan of fit your business.

Canva is a free to use online versatile app that lets you create stunning graphics, videos, and social media content with ease. You can also use Canva for desktop, work with templates, collaborate with your team etc.

WordPress is the leading website creation tool worldwide, powering over half of the web's content. This open-source content management system (CMS) is versatile and easy to use, making it an ideal choice for users of all skill levels. An entrepreneur should use the following elements as the starting point for building a plan and should modify them as needed to better tell the story of his or her new venture.

Q.3: Describe the following given terms in details.

- My Entrepreneurial Skills
- My Ideas for Small Business
- My Market
- Setting My Price

My Entrepreneurial Skills

Ans. There are different types of skills:

- Conducting myself (confidence in myself, managing my life, being responsible etc)
- Thinking (being creative, solving problems, making decisions, observing my surroundings, basing actions on needs and opportunities etc.)
- Interacting with people (working with others, accepting others irrespective of their cast, gender, social status, whether they have a disability or not, etc.)
- My safety and survival (self-preservation, first aid, drug abuse prevention etc.) What I can do (repairing items like mobiles, batteries, cooking, making crafts, reading, singing etc.)

My Ideas for Small Business

An entrepreneur should consider their community and identify its needs for products or services. They could approach this by identifying a difficulty the community is experiencing and then determining what product or service could help overcome that difficulty.

- What needs do I know about in my community?
- What can be done to address these needs?
- Which of my skills can be used to address these needs? How?

- Which of these needs can my colleagues and I develop into a business idea?

My Market

If a product or service is needed by a person or a group of people, there is a demand. The people who need the product or service and are willing to pay for it, are customers. The number of customers in the community represents the market for a service or product.

A business can estimate the size of its market by carrying out surveys of customer needs, preferences and willingness to pay. The survey should try to find answers to questions such as:

- Who are the people (the part of community) interested in my product (age, gender, income status, etc.)
- Why do they like or dislike my product (shape, size, colour, etc.)?
- Are they willing to pay a commercial price for it?
- Will they always want to buy the product regularly or seasonally (sustainable)?

Setting My Price

Most businesses will want to make a profit on products or services sold. Profit is the difference between the cost price and selling price. Part of this money can be put back into the business. Profit should be calculated as a percentage of the cost price. The profit margins should always be reasonable. Fixing the selling price of a product or service must take into consideration the following:

- Cost of production (including your own salary)
- Overheads
- Profit

It is therefore important to accurately calculate each of these, so that the final selling price is realistic.

Q.4: Break down the components of selling price calculation. OR
Cost of production + Overheads + Profit = Selling Price

Ans. Cost of Production and Overheads

Calculate each part or component that goes into production and overheads and add them up. Labor and depreciation of equipment (when equipment loses its value over time) may also need to be taken into account. In calculating the cost of labour, the entrepreneur should set a wage that adequately compensates the worker's knowledge and contribution, taking into account the experience and qualifications of worker, prevailing basic wage rate, government taxes and social security contributions.

Profits

The entrepreneur should set the level of profit made on the sale of a product service carefully, taking into account the relationship between demand for the product (how many people want it) and the available supply (number of products available to be sold). If demand is great for the available supply, the price (and thus the profit) may be increased. If there is a large supply, but few people want to buy, then prices may drop. An excessively high price due to a big margin of profit will dissuade customers. When sales increase, profit margins may be reduced. This can enable the entrepreneur to lower the selling price, therefore allowing the business to secure the market and even expand it.

Did You Know?
Formula to find Profit:
Profit= Selling Price– Cost Price

Q.5: What are the steps that can be taken while Devising a Business Plan? Discuss in details:
OR Explain the process of devising a comprehensive business plan.

Ans. Steps in devising and developing a business plan are discussed as follows:

Executive Summary

It is said that most critical portion of a business plan is the executive summary. Once, you have developed the whole business plan only then in the end an executive summary is devised; like a cherry on the top. Executive summary not only condenses the entire business plan but also offers a general overview about the main aspects to the reader.

You and Your Startup

As an entrepreneur, just like you would like potential people and companies to join you, similarly other party would like to know as well with whom they are about to shake hands and what are the intentions of this hand shake.

Your goals should be "SMART", as follows:

- S-Specific: Be precise and clear in setting up a goal
- M-Measurable: Goals should be quantifiable and can assessed
- A-Achievable: Set attainable small goals which can be achieved, that provides motivation to move forth.
- R-Realistic: Goals should be convincing in nature, not in the clouds.
- T-Time-Bound: Strategies and goals need to be reviewed for improvement, so set the stop watch.

Did You Know?
SWOT Stands for:
S= Strengths
W= Weakness
O= Opportunities
T= Threats

Analyze the Market

For the sake of your product and company's profit, it is quite critical to analyze the market situation and trends before starting the business. However, you need to keep an eye on the changing trends and demands of the market, to cope up with the supply. And don't follow your already devised strategy blindly.

SWOT analysis is a good technique to evaluate your product in context of the market. Your advantages, disadvantages, possibilities and risks are examined in a SWOT analysis. It highlights the best aspects of your business, skills you may lack, trends and opportunities in the market, risk factors, etc.

Enlist Products / Services

The major portion of your business plan should emphasize on your products / services. You may further decompose the products or services offered and sketch a breakdown for deeper understanding of the product to the reader.

Identify your Target Market

Every entrepreneur has a sketch of a client / company with whom he wishes to have a long-term association and so should be a plan to target such client (s) and retain them by providing qualitative service.

Precise Promotional Strategy

The same clientele whom you desire are the ones affecting your promotional strategy. So, you should be quite clear about pre-sale strategy and post-sale contacts and services to the clients. Those points are your bag of tricks with which you keep in contact your client and those are in fact real free-marketers for your product and company.

Budget

Every product and service provided takes time, money and effort. In terms of an entrepreneur you have to measure every parameter that you spend and assess it on real-terms.

Multiple Choice Questions

Select the suitable answer for the following Multiple choice questions.

1. What is a characteristic of entrepreneurship in the digital age?
   (a) Dependence on traditional marketing strategies
   (b) Emphasis on physical storefronts
   (c) Utilization of technology and online platforms
   (d) Reliance on offline networking events
2. Which of the following is a key advantage of digital entrepreneurship?
   (a) Limited reach and market access
   (b) Higher barriers to entry
   (c) Flexibility and scalability
   (d) Dependency on physical infrastructure
3. What does the term "disruptive innovation" refer to in the context of digital entrepreneurship?
   (a) Incremental improvements to existing products or services
   (b) Creating entirely new markets and value networks
   (c) Maintaining the status quo within an industry
   (d) Avoiding technological advancements
4. Which factor has significantly contributed to the growth of digital entrepreneurship?
   (a) Limited access to information
   (b) Slow internet speeds
   (c) High cost of technology
   (d) Global connectivity and digital infrastructure
5. How many Sustainable Development Goals (SDGs) were adopted by the United Nations in 2015?
   (a) 5 (b) 10
   (c) 17 (d) 20
6. Which of the following is NOT one of the Sustainable Development Goals (SDGs)?
   (a) Gender Equality
   (b) Clean Water and Sanitation

(c) Poverty Reduction
(d) Energy Efficiency

7. Which SDG aims to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all?
(a) SDG 1: No Poverty
(b) SDG 4: Quality Education
(c) SDG 7: Affordable and Clean Energy
(d) SDG 13: Climate Action

8. SDG 13 focuses on:
(b) Ending hunger
(b) Combating climate change
(c) Achieving gender equality
(d) Promoting sustainable cities and communities

9. Which SDG targets the conservation and sustainable use of oceans, seas, and marine resources?
(a) SDG 6: Clean Water and Sanitation
(b) SDG 11: Sustainable Cities and Communities
(c) SDG 14: Life Below Water
(d) SDG 16: Peace, Justice, and Strong Institutions

10. What does SDG 3 primarily focus on?
(a) Quality Education
(b) Good Health and Well-being
(c) Clean Water and Sanitation
(d) Decent Work and Economic Growth

11. SDG 9 aims to:
(a) End poverty in all its forms everywhere
(b) Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation
(c) Ensure access to affordable, reliable, sustainable, and modern energy for all
(d) Reduce inequality within and among countries

12. Which SDG emphasizes the importance of responsible consumption and production patterns?
(a) SDG 7: Affordable and Clean Energy
(b) SDG 9: Industry, Innovation, and Infrastructure
(c) SDG 12: Responsible Consumption and Production
(d) SDG 15: Life on Land

13. Which SDG focuses on reducing inequality within and among countries?
(a) SDG 5: Gender Equality
(b) SDG 10: Reduced Inequalities
(c) SDG 16: Peace, Justice, and Strong Institutions
(d) SDG 17: Partnerships for the Goals

14. SDG 17 highlights the importance of:
(a) Ending poverty
(b) Promoting sustainable agriculture
(c) Strengthening global partnerships for sustainable development
(d) Ensuring access to clean water and sanitation

ANSWERS

1.	c	2.	c	3.	b	4.	d	5.	c	6.	d	7.	b
8.	b	9.	c	10.	b	11.	b	12.	c	13.	b	14.	c

Short Questions Answers

Q.1 How has the digital age changed the landscape for entrepreneurs??

Ans. The digital age has democratized entrepreneurship by making it easier to access global markets, digital tools, and online venues. It lowers startup costs and allows firms to scale quickly, encouraging innovation and opening up opportunities for specialty products and services.

Q.2: How do social media platforms impact digital entrepreneurship?

Ans: Social media platforms are critical for digital entrepreneurship because they give low-cost marketing channels, enable client engagement, and increase brand visibility.

Q.3: How does e-commerce effect entrepreneurship?

Ans: E-commerce has changed entrepreneurship by allowing businesses to offer their products and services online to a worldwide customer base. It eliminates the overhead expenses associated with physical storefronts, provides data-driven insights into consumer behavior.

Q.4: What is Digital Age?

Ans. The **Digital Age**, often known as the **Information Age,** was defined by the increasing use of computers, the internet, and digital technologies. It includes improved worldwide connectivity, huge data collection, and the automation of numerous activities.

Q.5 What are some crucial digital tools for modern entrepreneurs?

Ans: Modern entrepreneurs rely on e-commerce platforms (such as Shopify), social media management tools (such as Hootsuite), project management software (such as Trello), and digital marketing tools (such as Google Analytics). These tools improve productivity, marketing efficiencies, and customer relationship management.

Q.6: How might digital payment systems aid entrepreneurs?

Ans: Digital payment platforms like PayPal and Stripe help entrepreneurs by offering secure, efficient, and convenient transaction ways. They improve cash flow management, foreign sales, and customer trust by ensuring reliable payment processing.

The 1998 Data Protection Act

Q.7: What challenges do digital entrepreneurs face?

Ans: Digital entrepreneurs face challenges such as intense competition, cybersecurity threats, and the need to continuously adapt to rapidly changing technologies. Additionally, managing online reputations and meeting evolving consumer expectations require strategic planning and agility.

Q.8: How has the gig economy influenced entrepreneurship?

Ans: The gig economy has influenced entrepreneurship by offering flexible work opportunities and enabling freelancers and independent contractors to monetize their skills.

Q.9: In what ways can digital analytics improve business strategies for entrepreneurs?

Ans: Digital analytics can improve business strategies by providing insights into customer behavior, market trends, and campaign performance. Entrepreneurs can use this data to optimize marketing efforts, enhance customer experiences, and make informed decisions to drive growth and profitability.

Q.10: Which skills are encompassed in the 4C's of 21st century learning?

Ans: The **4Cs** of 21st-century learning encompass the following skills:

1. Critical Thinking: Analyzing information logically to solve problems and make decisions.

2. Creativity: Generating innovative ideas and thinking outside the box.

3. Collaboration: Working effectively with others in diverse teams to achieve common goals.

4.Communication: Clearly and effectively expressing ideas through various mediums and understanding others.

Q.11: Describe the Define Phase in Design Thinking?

Ans: The Define phase of Design Thinking focuses on explicitly describing the problem to be solved using insights gained from the

Empathize phase. It entails synthesizing user research to find trends and formulate a focused problem statement, often known as a **"point of view" (POV)** statement.

Q.12: Why is Collaboration Essential in the 21st century?

Ans: Collaboration is crucial in the twenty-first century because it brings together varied viewpoints and skills, resulting in more imaginative and effective solutions. In an interconnected world, cooperation allows individuals to tackle complicated challenges that are beyond the capabilities of a single person.

Q.13: What are the Sustainable Development Goals?

Ans: The Sustainable Development Goals (SDGs) are a series of 17 worldwide objectives developed by the United Nations in 2015 to solve pressing social, economic, and environmental issues by 2030.

SOLVED EXERCISE

Multiple Choice Questions

1. Which are the function of an entrepreneur?
   (a) Risk bearing
   (b) Innovation
   (c) Organizing and managing
   (d) a, b, c
2. An entrepreneur enters in to business to improved quality product by their invention and discoveries comes under:
   (a) Technical entrepreneur
   (b) Professional entrepreneur
   (c) Novice entrepreneur
   (d) a, b, c
3. An entrepreneur who introduce new idea, methods of production and discovers new market is called as:
   (a) Technical entrepreneur
   (b) Innovative entrepreneur
   (c) Novice entrepreneur
   (d) a, b, c
4. Entrepreneurship can ..... the Gross National Product:
   (a) Increase
   (b) Decrease
   (c) Neither increase nor decrease
   (d) None of a, b, c
5. Entrepreneurship can the Unemployment:
   (a) Increase
   (b) Neither increase nor decrease
   (c) decrease
   (d) a, b, c
6. A stable and dynamic political environment play:
   (a) Positive role in business growth
   (b) Negative role in business growth
   (c) No role in business growth
   (d) None of a, b, c
7. A business plan is a written summary of:
   (a) Proposed business venture
   (b) Its operational and financial details
   (c) Its marketing opportunities and strategy
   (d) a, b, c

ANSWERS

1	d	2	a	3	b	4	a	5	c	6	a	7	d

Long Questions Answers (Exercise)

Q.1 How well does the entrepreneur fit the entrepreneurial profile described in this chapter?

Ans. Long Question 1 **(Ans. Pg # 156-157)**

Q.2 Interpret the advantages and disadvantages that the entrepreneur sees in owning a business.

Ans. Entrepreneurs see potential where most people see only problem or nothing at all, a characteristics that often makes them the objects of ridicule (at least until their ideas become huge successes)

The benefits of Entrepreneurship

Driven by these personal characteristics, entrepreneur establish and manage small businesses to gain control over their lives, make a difference in the world, become self-fulfilled, reap unlimited profits, contribute to society and do what they enjoy doing.

The Drawbacks of Entrepreneurship

Entrepreneurs also face certain disadvantages, including uncertainty of income, the risk of losing their investments (and more), long hours and hard work, a lower quality of life until the business gets established, high stress levels and complete decision-making responsibility.

Q.3 Conclude the advices that could be offered to someone who is considering to launch a business.

Ans. (Long questions # 2, Pg # 157-158)

Q.4 Articulate the main reason for young people to be involved in business.

Ans. Young people are increasingly driven to business for a variety of compelling reasons, including the need for personal fulfillment and self-expression. In today's fast changing world, entrepreneurship allows young people to put their hobbies, interests, and innovative ideas into viable businesses. Whether it's beginning a tech firm, establishing a social enterprise, or targeting a specific market, entrepreneurship allows young entrepreneurs to channel their energy and passion into meaningful projects that reflect their values and objectives.

Financial Freedom:

Financial freedom and wealth creation are also important motivators for young individuals starting businesses. Entrepreneurship has the potential for financial prosperity and long-term sustainability, giving young people the opportunity to develop wealth, protect their futures, and pursue their goals. Many young people are drawn to entrepreneurship because of the promise of financial freedom and the opportunity to succeed on their own terms.

Finally, the biggest reason for young people to get involved in business is the possibility for self-discovery, empowerment, and making a significant influence. Whether motivated by a desire for personal fulfillment, autonomy, professional development, financial independence,

Q.5 Enlist contributions that small businesses make to our economy.

Ans. Small businesses play a crucial role in contributing to the economy in various ways:

Job Creation: Small firms make major contributions to job creation, frequently serving as the primary source of job possibilities in areas. They provide employment chances for a wide spectrum of people, including locals, recent graduates, and those seeking flexible work arrangements.

Innovation and Creativity: Small enterprises are hubs of invention and creativity, propelling technology developments, product creation, and service innovations. Their agility and ability to respond swiftly to changing market needs allow them to create new products, services, and business models that help to drive economic growth and competitiveness.

Entrepreneurship and Wealth Creation: Small businesses serve as a platform for entrepreneurs, allowing them to transform their ideas into viable businesses. They provide opportunities for wealth growth and upward mobility.

Resilience and Economic Stability: Small businesses help to increase economic resilience and stability by diversifying economic activity, minimizing reliance on a few large firms or industries, and

encouraging competition. Their presence serves to reduce economic shocks and downturns, hence promoting general economic stability and recovery efforts.

Local Economic Development: Small companies contribute to local economic development by attracting investment, increasing foot traffic, and rejuvenating commercial districts. They help to grow ancillary businesses like hotel, retail, and professional services, while also creating multiplier effects that assist the overall economy.

To summarize, small businesses contribute to the economy in a variety of ways, including job generation, innovation, entrepreneurship, wealth creation, community support, supply networks, economic resilience, and local economic growth.

Lab Activities

Activity 1

Design a marketing oriented Business Plan of your interest.

Ans. Practical/ Lab or Class Work:

Outlines for Teacher's Guidance:

1. Executive Summary.
2. Company Description
3. Market Analysis.
4. Marketing Strategy
5. Sales and Distribution 6. Customer Service
7. Financial projections 8. Risk management.
9. Implementation Plan.
10. Conclusion.

Activity 2

Design a Social Media Marketing Strategy for selling of packed sea food products.

Ans. Practical/ Lab or Class Work:

Outlines for Teacher's Guidance:

- Identify Target Audience:
- Choose Social Media Platforms:
- Create Compelling Content:
- Engage with the Audience:
- Influencer Partnerships:
- Educational Content:
- Promotions and Discounts:
- Paid Advertising:
- Monitor and Analyze Performance:

Activity 3

Calculate a cost of production of any tool or equipment available in your classroom.

Ans. Practical/ Lab or Class Work

Activity 4

Choose an entrepreneur in your community and interview him or her. What's the "story" behind the business?

Ans. Practical / Lab or Class Work

ABBREVIATIONS

Abbreviation	Description
HPC	High Performance Computing
ALU	Arithmetic Logic Unit
AI	Artificial Intelligence
CD - ROM	Compact Disk Read Only Memory
CLI	Command Line Interface
CPU	Central Processing Unit
CRT	Cathode Ray Tube
CU	Control Unit
DOS	Disk Operating System
DSL	Digital Subscriber Line
DVI	Digital Visual Interface
ENIAC	Electronic Numerical Integrator And Computer
GUI	Graphical User Interface
HTML	Hypertext Mark-Up Language
IBM	International Business Machines
IC	Integrated Circuit
ISDN	Integrated Services Digital Network
ISP	Internet Service Provider
IT	Information Technology
LAN	Local Area Network
LCD	Liquid Crystal Display
LSI	Large Scale Integration
MAN	Metropolitan Area Network
MSI	Medium Scale Integration
NIC	Network Interface Card
OS	Operating System
PAN	Personal Area Network
PIN	Personal Identification Number
RAM	Random Access Memory
ROM	Read Only Memory
SSI	Small Scale Integration
USB	Universal Serial Bus
UNIVAC	Universal Automatic Computer
WAN	Wide Area Network
VLSI	Very Large Scale Integration

Federal Board Model Paper Based on S.L.O

MODEL PAPER FEDERAL BOARD

Paper: Computer **OBJECTIVE** **Class: 9th**
Time Allowed: 15 minutes **Marks: 13**

SECTION – A

1. In 1890, Herman Hollerith build a tabulating machine called:
   (a) Hollerith Desk ● (b) Difference engine ○
   (c) Analytical engine ○ (d) Pascaline ○
2. Microprocessor was developed which resulted in the development of:
   (a) Chip ○ (b) Transistors ○
   (c) IC ○ (d) Microcomputers ●
3. DVD stands for:
   (a) Digital Versatile Disk ● (b) Digital Disk ○
   (c) Versatile Disk ○ (d) Disk ○
4. _____ processes the data according to the instruction given to it
   (a) Operation ○ (b) RAM ○
   (c) ROM ○ (d) Microprocessor ●
5. How many computational problems are available?
   (a) 1 ○ (b) 2 ○
   (c) 3 ● (d) 4 ○
6. Which is a graphical representation of an algorithm?
   (a) Matrix ○ (b) Graph ○
   (c) Flowchart ● (d) Solution ○
7. The diamond symbol represents the:
   (a) Input/output ○ (b) Decision making ●
   (c) Processing ○ (d) Remarks ○
8. Breaking down the larger problems into smaller/ manageable ones and working on them one by one is called.
   (a) Abstraction ○ (b) Decomposition ●
   (c) Algorithm design ○ (d) Pattern Recognition ○
9. Everything in HTML is identified on the basis of _____.
   (a) Brackets ○ (b) Title ○
   (c) Tags ● (d) Image ○
10. First row of table in HTML is called _____.
    (a) Title row ○ (b) Top row ○
    (c) Header row ● (d) Upper row ○
11. Which of the following is not one of the characteristics of big data?
    (a) Veracity ○ (b) Velocity ○
    (c) Validity ● (d) Volume ○
12. In the context of big data, what does the 3Vs refer to?
    (a) Veracity, Velocity, Veracity ○ (b) Volume , Value, Velocity ○
    (c) Validity, Variety, Volume ○ (d) Variety, Velocity, Volume ●
13. What is a potential disadvantage of AI according to the information provided?
    (a) Creativity limitations ● (b) Reduced job loss ○
    (c) Lowered costs ○ (d) Enhanced emotional capabilities ○

MODEL PAPER FEDERAL BOARD

SUBJECTIVE

Paper: Computer **Class: 9th**
Time Allowed: 2:45 Hours **Marks: 42**

SECTION – B (Marks 22)

Q.2 Attempt all parts from the following. All parts carry equal marks. (11×2=22)

i) Describe Mark 1 by Howard Aiken.	OR	What is a system?
ii) Define Memory.	OR	What is Operating System (OS)?
iii) What is Repetition?	OR	How decision problem occurs?
iv) What is Flowchart?	OR	How algorithm thinking works?
v) Why do we need to think computationally?	OR	What is the role of AI in Education?
vi) What is Chatbot?	OR	What is Cloud Computing?
vii) Define Hybrid Cloud.	OR	Differentiate between Website and Webpage.
viii) Define Web Application.	OR	What is CSS?
ix) What is Variable?	OR	Explain the role of <body> tag-pair in a document.
x) What is computer system?	OR	Define E-Commerce.
xi) How has computing impacted education?	OR	What is Digital Age?

Section – C (Marks 20)

Note: Attempt the following questions. (4×5=20)

Q.3	Discuss natural and artificial systems.	**OR**	What are input devices? Explain different input devices.
Q.4	What is application software? Explain its types.	**OR**	Discuss network communication components?
Q.5	Describe problem solving steps.	**OR**	What is computational thinking? Discuss its properties.
Q.6	Describe data set and database in details.	**OR**	Explain the use of Hardware and Software.

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